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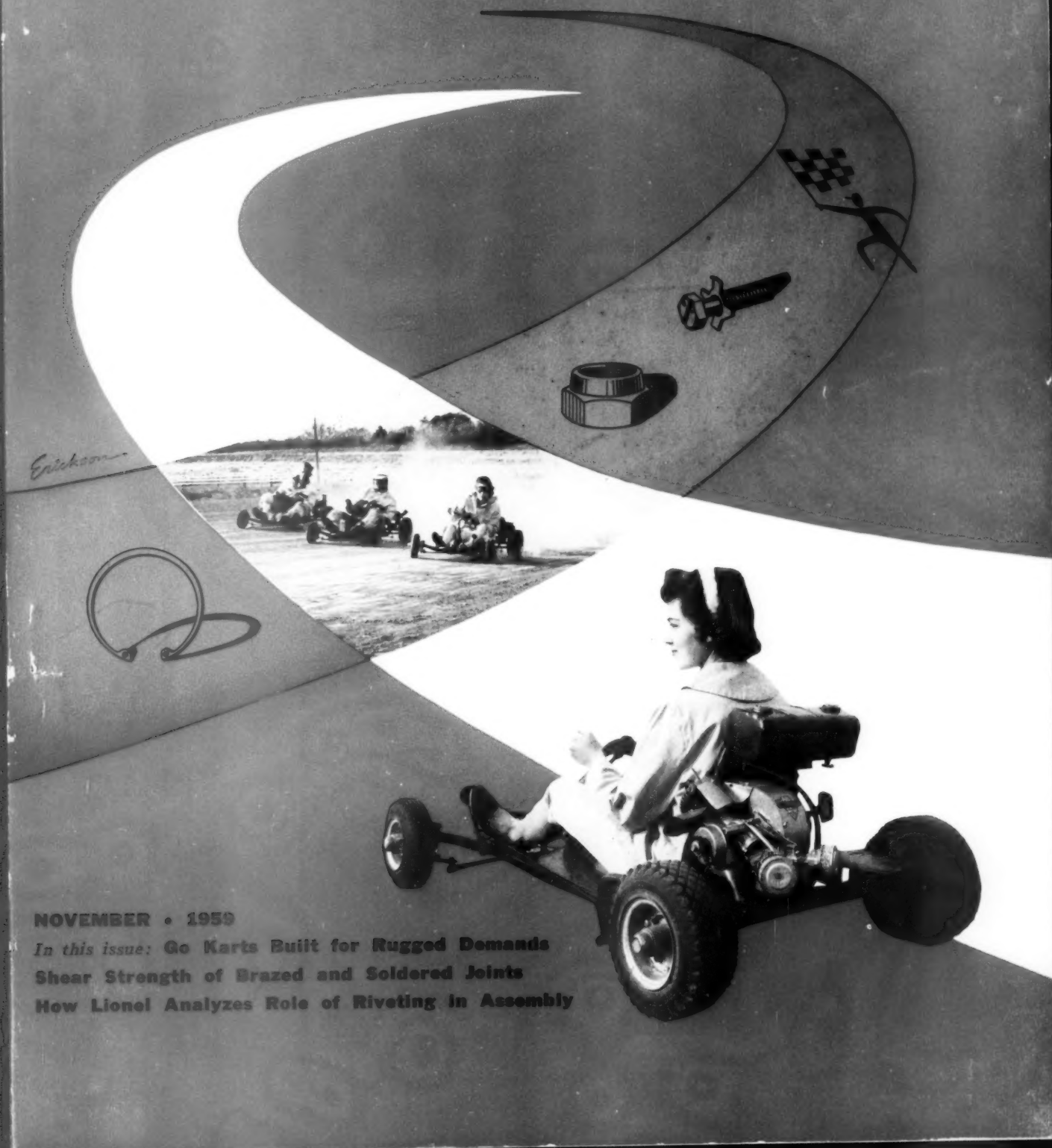
assembly & fastener ENGINEERING



NOVEMBER • 1959

In this issue: **Go Karts Built for Rugged Demands**
Shear Strength of Brazed and Soldered Joints
How Lionel Analyzes Role of Riveting in Assembly

and here's how Pheoll solved it

Relaxation comes easy to a man who just saved his company $10,312! That's what happened when Pheoll looked to see if economies could be effected in the assembly of a power chain saw. A typical Pheoll-team study of the problem led to the development of a special fastener for attaching main drive to crankcase.

Previously, the part was milled from 1⅞" bar stock, involving several operations that removed more than half the total weight. The new part is formed by the chipless method and extruded by Pheoll to the specified structural requirements from a special steel rod less than half the diameter of the original stock. There is virtually *no scrap loss* . . . with considerable savings in both material and machining time effecting a cost reduction of $4.02 per thousand units!

The Pheoll team can upgrade your product too, at reduced material and assembly costs. Let us show you how. Contact your Pheoll field man or write . . .

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PHEOLL P

HEADING THE FASTENER INDUSTRY FOR OVER 50 YEARS

assembly & fastener ENGINEERING

November, 1959 Volume 2, Number 2

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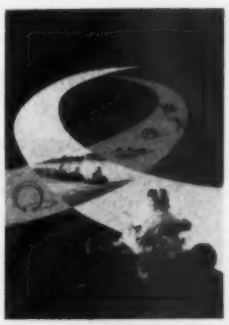
• Go Kart engines must be designed to withstand rugged competition plus constant overhauling by their hobby-mechanic owners. For a story on the role of five fasteners in these engines, turn to page 28.



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STYLE K-216

STYLE K-214-U

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Letters to the Editor

Poor Quality: Whose Fault?

You hit the nail squarely on the head in the September editorial entitled, "Poor Quality: Whose Fault?". My copy is already badly dog-eared from being passed around. May I please have a half-dozen reprints?

I certainly agree with your analysis of this situation and admire your editorial policy in publishing it.

Quality Control Manager
(Farm Implement Company)

Torque, Tension Tightening

In your May issue the first of two articles appeared entitled "Tightening Threaded Fasteners". We have been following your recent articles on bolting and torque-tension relationships with a great deal of interest. Unfortunately, the June issue did not get to this office. Would you please send me a copy?

Robert Koester
Supervisor
Technical Service Dept.
The Wm. Powell Company
Cincinnati, Ohio

We understand that you have published a very fine series of articles on "torquing of studs and bolts". We would greatly appreciate receiving copies of these articles if they are still available.

Isabelle Rudden
Librarian
Vickers, Incorporated
Detroit, Michigan

The DC-8 Jetliner

Your extensive coverage of our DC-8 assembly facilities in September was appreciated by all of us at Long Beach. Because of the intense interest in this article, may we have six sets of tear sheets?

Wilbur H. Morrison
Manager, Public Relations
Long Beach Division
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Long Beach, California

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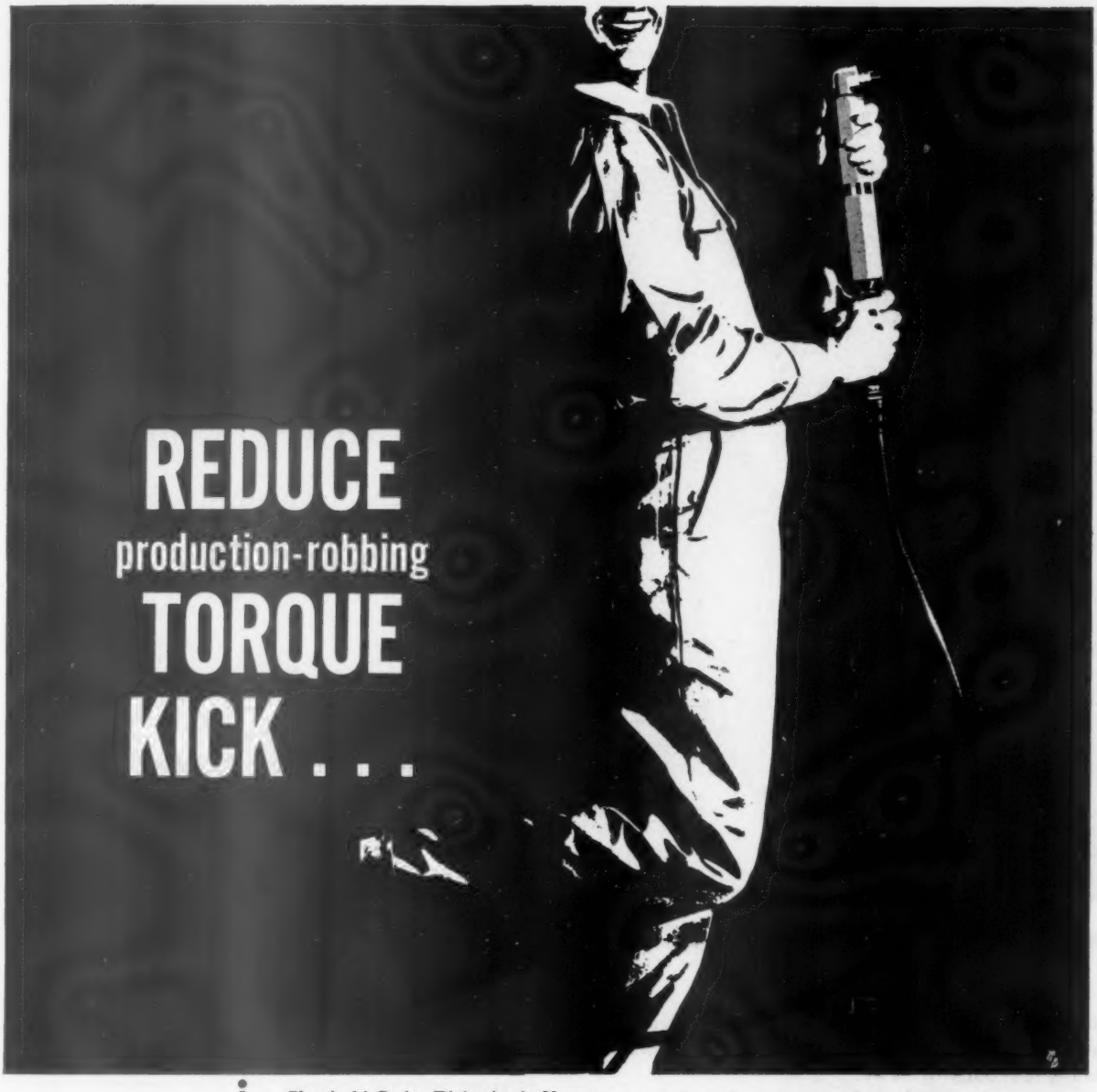

. . . with a Cleco automatic shutoff 14 series right angle nutsetter

Cleco's 14 Series Right Angle Nutsetter can help perk up your production without extra effort from your operators. Here's how: The Cleco 14 ARA Nutsetter contains a dependable shutoff mechanism which stops the air motor instantly when preset torque is attained. And, torque reaction is substantially reduced, thereby decreasing hazardous, tiring tool kick.

This high-production nutsetter is economical, too. A new friction-free clutch permits extremely long periods of operation with negligible clutch wear. The clutch also provides superior torque control. An easily adjusted, no-drift locking device positively maintains torque that is preset to your specifications.

These attractive features make the Cleco 14 ARA an even better buy: Rugged, but weighs less than five pounds. Converts easily to a two-way tool—double-end spindles available at no extra cost permit the removal of nuts by simply revolving the spindle 180 degrees.

Call *your Cleco representative and find out for yourself what a Cleco 14 Series Right Angle Nutsetter can do for your production output.*

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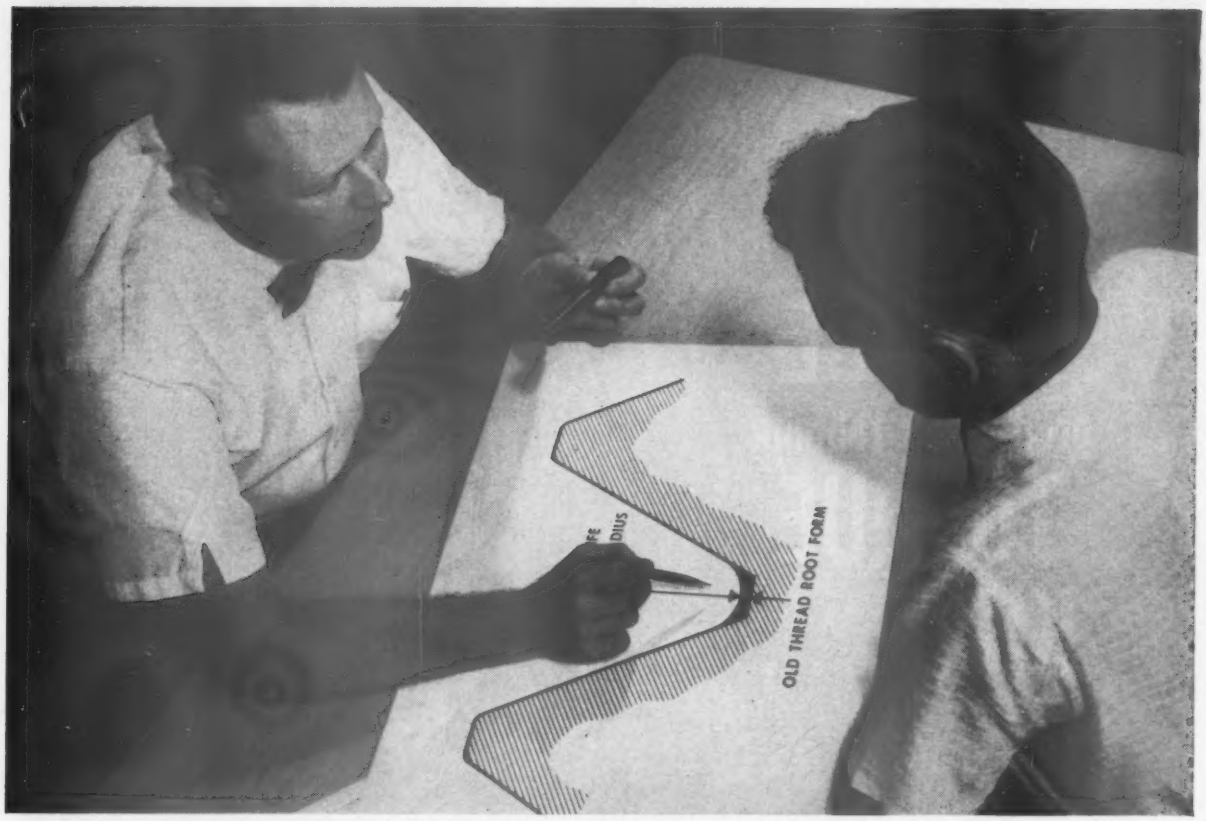
The big change is in the threads



Extra strength for screw-fastened assemblies. New UNBRAKO Hi-Life thread form developed by SPS research features smoothly radiused contour, with more metal at root. New profile virtually doubles fatigue life, adds tensile strength. Hi-Life screws fit standard tapped holes, cost no more than former UNBRAKOs.

New thread form on UNBRAKO Hi-Life cap screws increases fatigue life up to 100% . . . gives your product added reliability at no extra cost.

For years the conventional thread root form for socket screws has been a truncated V with flat root. In the new UNBRAKO Hi-Life screws this is changed, the root being smoothly radiused from flank to flank. The result? A major reduction in stress concentrations at this critical point.

In terms of fastener performance, tests show the new UNBRAKO Hi-Life socket head cap screw gives you up to 100% more fatigue life than flat root screws. And you also get a bonus in tensile strength, because UNBRAKO Hi-Life has more metal at its minimum cross section. Both benefits are achieved without effect on gaging or ease of engagement.

New Hi-Life UNBRAKOs give your product added insurance against failures caused by dynamic stresses—particularly under field conditions where screws may not always be seated or tightened properly. And on the assembly line, their greater tensile strength permits higher preloading, which lengthens fastener fatigue life.

Your authorized SPS distributor has new UNBRAKO Hi-Life socket screws in stock now in sizes #4 through 1½ inch. See him for details, or write SPS—manufacturer of precision threaded industrial fasteners and allied products in many metals, including titanium. Request new Bulletin 2577.

TENSION-TENSION FATIGUE TESTS

½-20 Socket Head Cap Screws

Testing Speed: 1050 CPM	Average Fatigue Cycle Life	
Alternating Stress (psi)	Old Thread Root Form	UNBRAKO Hi-Life Thread
7,000 to 70,000	22,900	40,000
5,000 to 50,000	56,650	89,950
4,000 to 40,000	120,700	232,350
3,000 to 30,000	598,000	1,808,000
2,000 to 20,000	2,076,000	8,000,000*

*Test stopped—no failure

Tests run on ½-20 Hi-Life socket head cap screws show an increase of up to 100% in fatigue life over old-style screws with flat root. Radiused root of UNBRAKO Hi-Life thread reduces stress concentration at point where majority of fatigue breaks occur.

INDUSTRIAL FASTENER Division SPS

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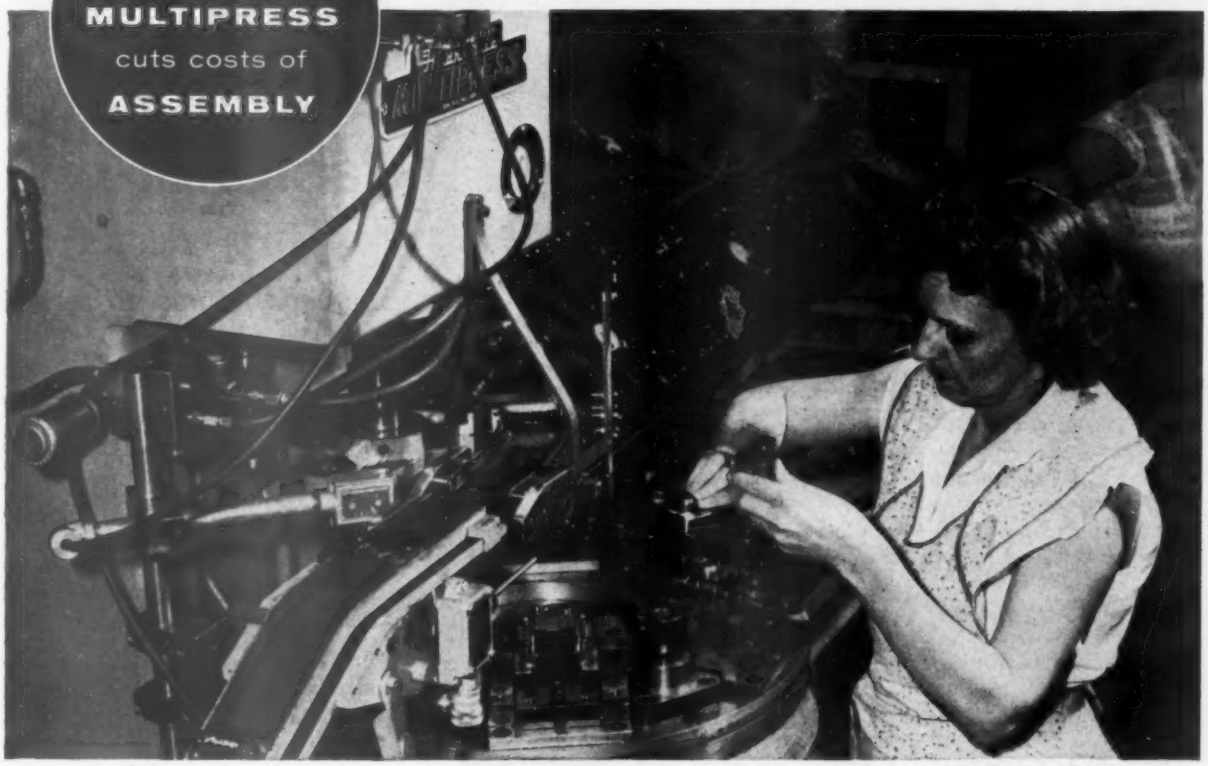
How **DENISON MULTIPRESS** cuts costs of **ASSEMBLY**

ONE OF THREE, *this Deniston 4-ton hydraulic Multipress is equipped with 6-station automatic index table to assemble both halves of lamination stacks of small electric motors.*



Savings with **DENISON** Multipress justify MAPI replacement recommendations at **BARBER-COLMAN**

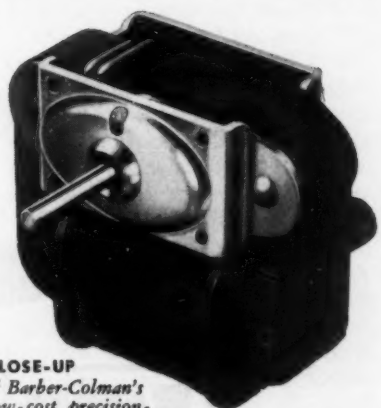
. . . line of 3 new hydraulic presses simplifies and speeds small motor assemblies

Installed upon recommendation of a MAPI replacement analysis, three Denison hydraulic Multipresses are today meeting predicted cost reductions in assembly operations at Barber-Colman Company, Rockford, Illinois.

Operating in a line and connected by conveyor belts, these three hydraulic presses handle—on a semi-automatic basis—such operations as bending, staking, aligning, compressing, riveting and stamping in the production and assembly of small electric motors.

In addition to more efficient handling of production functions, the quality of output is more uniform because exact pressure is duplicated on each stroke of the hydraulic ram.

Savings in cost and uniform production like this can be duplicated in your shop today. A cost reduction study by a Denison Specialist in press work can show you how. Write today for a descriptive catalog on the complete Multipress line.



CLOSE-UP
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NYLOK FASTENERS lock and seal by means of a tough nylon pellet embedded in the body of the fastener. Locking and sealing action is sustained, because the nylon attempts to return to its original shape when deformed. Nylok fasteners make excellent adjustment screws, oil pan and gear case bolts.
LOK-THRED meets conditions of severe vibration, tension, torsion, thermal loading. Lok-Threds can never back out, fret or shake loose. Because of its unique reforming and intimate metal to metal contact, Lok-Thred seals effectively in practically all metals. Widely used on engines and motors of all sizes and types.
PLACE BOLTS have a built-in spring action in the head of the bolt. This provides a safety margin of additional elastic elongation, and greatly reduces danger of fatigue failure in addition to locking. Place Bolts can be used wherever Cap Screws are used, and effect real savings in most applications.

Which self-locking fastener?

Lamson makes all three, helps you cut costs, not corners

Nylok. Lok-Thred. Place Bolt. All are variations on the same theme. However, one of the three will be better suited to your application. One will lower your assembly cost more than the other two. Which one?

Because Lamson makes all three self-locking fasteners . . . standards and specials . . . Lamson engineers are anxious (and able) to recommend the one that's best for you. That helps you make a better product. That helps you cut costs . . . not corners. Contact a Lamson Sales Engineer for details.

SEND FOR ENGINEERING DATA

Gentleman: Mail engineering data on Place Bolts ☐ Lok-Thred ☐ Nylok ☐

Have nearest Sales Engineer call for appointment ☐

Application we're considering is _____

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THE EDITOR'S VIEW

NOVEMBER, 1959, VOL. 2, NO. 2

FASTENING IDEAS COME FIRST–THE MARKET FOLLOWS

Now and then we get calls from research men who want market figures on different types of fasteners. They want to study the market to see if it would be worthwhile for their company or client to plunge into the fastener business with a new idea.

For my money they are seeking statistics which will seem most inviting, but will be virtually meaningless where a new fastener is concerned. Certainly, there is a tremendous market for fasteners, but it does not follow that a slice of that market is there just for the plucking.

If a new fastener fills a specific need, its market will search it out following proper promotion. And this market will grow in proportion to the fastener's usefulness, cost, and adaptability.

In the annals of the industry there are many examples of this. A classic concerns the Tinnerman kitchen range which was popular several decades ago. To solve a troublesome fastening problem, the manufacturer came up with a spring steel clip. Other manufacturers got interested in his clips, so he left the appliance business to enter the fastener business.

More recently a new fastener was developed because a loose nut on the connecting rod of a racing car led to the death of two people. A witness to this tragic accident, a former racer himself, decided to develop a nut that would not come loose. After ten years of research he found it and started a new fastener company. His story will be told in a later issue.

And just in the past month we came across a new insert which holds great promise. In this instance, a small sub-contractor has been engaged in aircraft and missile work.

He normally had no need for steady assembly help, so when it came time to assemble the components, engineers were taken off the drafting boards to do the intricate job of wiring the fasteners in place on these sub-assemblies.

This was expensive assembly help, so he decided that a different type of insert was needed which would hold fasteners firmly in place in these components without the need for safety wire. He has come up with an insert which looks like it will do the job. It is now undergoing vibration and high temperature tests.

The point here is that the clip, the nut, and the insert were first developed to solve a specific problem. The markets followed for both the clip and the nut, and will surely follow for the insert if it passes its tests successfully.

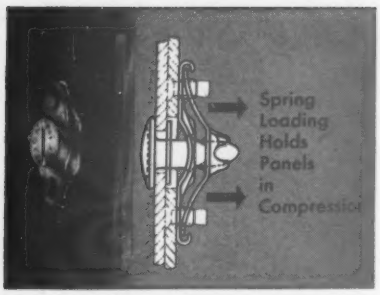
Managing Editor

Quick-Opening Fasteners

Selecting Small Fastenings for Metal Closures

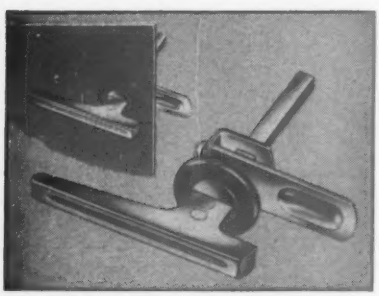
*"Use captive fasteners wherever feasible . . . Avoid the use of loose washers and loose nuts . . . Fasteners on equipment covers should be operable either with no tools or with standard hand tools"**

(John D. Folley, Jr. & James W. Altman, Research Scientists, American Institute for Research)



Quarter-Turn Fastener

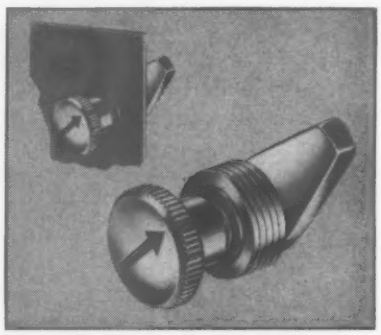
Lion Fasteners open and close with a ¼ turn, hold sheets tightly under the compression of a rugged spring. Quickly operated and fully retained in the outer panel, they are approved under U. S. Government military specifications. Stud and receptacle float for easy alignment and simplified hole preparation. Flush, oval, wing, knurled, ring, and key head styles available. Sizes—No. 2, No. 5, and High Strength for extra heavy duty.



Cabinet Latch

Just drill a hole, push the fastener stem through, and slide the special push-on clip into place. No welds, screws, bolts or rivets: the fastener is permanently installed in seconds!

Adjustable to any grip length or panel thickness, the pawl is fixed in place by a single set screw. The fastener's brightly finished knob is set off by a plated washer. Also furnished with screwdriver operated flush head.

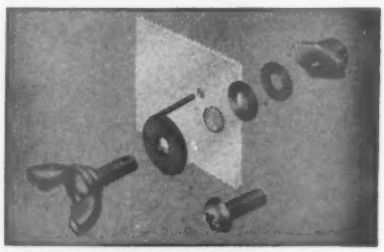


Spring Tension Latch

For fastening slide-out drawers and hinged panels the Southco Arrowhead Latch is recommended. It locks or opens with a quarter turn yet occupies less than ½" inside space.

Doors are held under spring tension—a push against the arrowhead knob relaxes this tension, allows operation with fingertip ease. Drill a single hole for installation—no fastening to the door is necessary. No striker plate is needed.

Pawl stop is eliminated—arrowhead shows at a glance exact position of pawl.



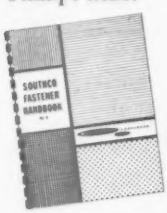
Adjustable Panel Latch

Small doors and panels can be fastened with greatest speed and lowest cost with the Southco Adjustable Latch.

The entire fastener is quickly installed through two holes punched in the door; no bolts or rivets are needed.

It operates with a quarter turn, requires no striker plate. An extra twist after the nylon pawl is engaged pulls up the door to form a seal and eliminate vibration.

Available with wing, knurled, or Phillips head.



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Write on your letterhead to Southco Division, South Chester Corporation, 257 Industrial Highway, Lester, Pa.

SOUTHCO FASTENERS

LION

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* *Quotation from "Designing Electronic Equipment for Maintainability"; Machine Design, July 12, 1956.*

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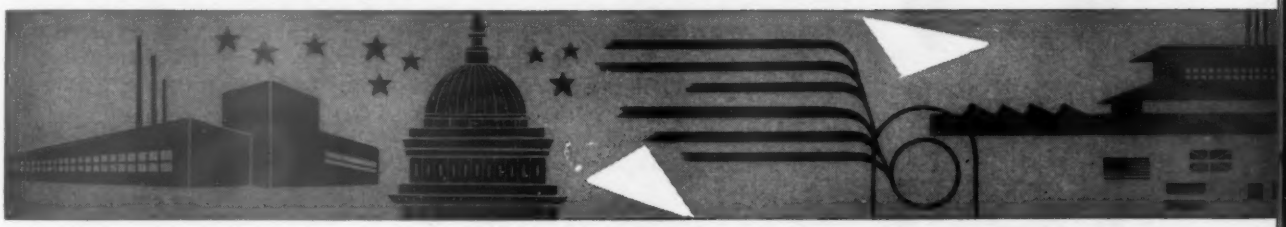
The State of Business



ANSWERING FOREIGN COMPETITION

by **Ralph E. Cross**

Consider this fact—industry must invest 40 billions annually in plants and machinery to maintain the jobs that are in existence today, and to provide jobs for the 500,000 people entering the labor force every year. Every new job costs from $12,000 to $15,000, and every job in existence requires an expenditure of $450 annually to keep it alive.

If we want to maintain our present living standards, we must keep pumping large amounts of capital into new plants and equipment, and we must have a high rate of technological progress to do it. On the surface, this seems like something we ought to do with one hand—after all, look at what's been accomplished in the last 100 years. All we have to do is more of the same. True, but we're not doing it!

Instead, the American dollar is being viewed with suspicion. In the past few years gold has been flowing away from the U.S. More Americans are investing in companies abroad. A few months ago, 80 members of the New York Society of Security Analysts took a tour of Europe to get a first-hand look at some of the companies. At least seven leading American mutual investment funds have sent teams to Europe to check on investment opportunities.

All of this adds up to a lack of confidence in our ability to continue to grow and prosper.

But the most disturbing move of all is that more and more American companies are building plants abroad to protect their markets. This leads to the export of capital goods dollars, which are often called multiple purpose dollars because they have a multiplying effect on growth and jobs. When a plant is built in a foreign country instead of the U.S., it's the foreign country that gets the taxes and job opportunities, not for a year, but for the life of the plant.

In many cases, it is cheaper to make a U.S. product in Europe and to ship it across the ocean than it is to make it here at home. This is simply one more manifestation of the fact that the U.S. is gradually pricing itself out of world markets.

What disturbs me is the muddled thinking we find about some of these situations. For example, today there is a popular notion that automation is taking jobs away from factory workers. Automation or technology hasn't caused unemployment. Whenever it is applied, it is only the final act in a whole chain of events. It is the result of a set of circumstances that are already economically untenable. The cause or causes could be any one or more of a hundred things, such as high taxes, high wages, labor grievances, need for a new product design.

Another bit of muddled thinking is the idea that we can correct all of our problems by passing laws and exercising controls.

In 1955, Walter Reuther was advocating the guaranteed annual wage as just the right control needed to regulate the introduction of automation. The annual wage is dead for the moment, but the drive for regulation marches on.

RALPH E. CROSS

Executive Vice President
The Cross Co., Detroit

R. E. Cross was cited by the ASTE in 1956 for his work in linking automation to machine tools. With The Cross Co. since 1932, he is widely consulted by the Government and industry.

Jack Connelly, the UAW's representative to the National Planning Organization, is now demanding laws to regulate automation to protect workers' jobs.

All of these moves towards regulation are designed with the idea of maintaining status quo. They are diametrically opposed to the action that we should be taking to stimulate industrial growth and employment.

How many cars do you suppose the auto industry would be making this year if they had maintained status quo in car design, manufacturing methods and sales and advertising campaigns for the past year or two? My guess is that they would be reach-

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RETAINING RINGS
cut costs,
simplify assembly

Precision-engineered INDUSTRIAL Retaining Rings . . . internal, external and open types . . . are available in a wide selection of sizes and finishes. Solve your fastening problems simply and economically with the rings that cut machining and tooling expense, save material, simplify and speed assembly.

Series 1000 and 2000 are available *stacked* for quickest application.

Write for free ring samples and catalog.

IRR *Originators of modern retaining ring dispensing*

INDUSTRIAL RETAINING RING COMPANY
Dept. A-11, 57 Cordier Street
Irvington 11, New Jersey
Use postpaid card. Circle No. 212

ing for a three million instead of a six million car year. I hate to think what the effect would be on unemployment.

It is time that we realize that the very essence of growth is the destruction of the old way of doing things and constant replacement with new technology. Toward this end, I would like to propose four areas that deserve our utmost attention.

1. Continued expanded research.

2. Progressive depreciation policies. Depreciation provides one of the major sources of funds for re-investment.

A few years ago, tax laws in the U.S. were changed to provide a faster recovery of capital. It is now possible to recover between two-thirds and three-quarters of the investment in the first half of the life of the asset.

Unfortunately, capital recovery in the U.S. is the slowest of any industrial country in the world. It takes from 12 to 30 years to recover capital invested in machine tools in the U.S. as opposed to 4 to 8 years in Europe.

3. Increased productivity. There is little doubt that wages are too high in relation to the wages paid in Europe. Even Reuther recognizes this. Recently, he was in West Berlin promoting a campaign to raise the wages of European auto workers in order to cut the competitive price edge now enjoyed by cars made in Europe.

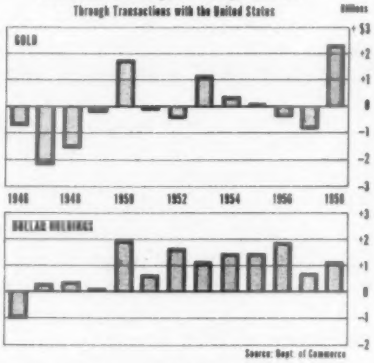
In the metalworking industry, the American factory worker is paid four to six times more than his European counterpart. This condition might be offset to some extent if we could get rid of "make work" and "feather-bedding" practices. I estimate that 25% of our production is wasted in this fashion.

4. Incentives for Success. If we are going to continue to lead the world in technology, we are going to have to provide the incentives that will motivate people to greater effort. Today, we have a passion for equality that is stifling progress. It exists in our tax laws, in our labor contracts, yes, and even in our schools.

"**Soak the rich;** pay everyone the same rate; promote by seniority," this is the order of the day. "No one should gain anything for extra effort, and no one should be penalized for lack of effort." In certain segments of our society, it is a positive disgrace to succeed.

Can we get rid of this roadblock in our thinking? •

Increase or Decrease in the Gold and Dollar Holdings of Foreign Nations
Through Transactions with the United States

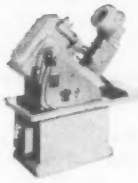


Foreign nations have added to their dollar holdings in every year since 1946, while the flow of gold, as the result of transactions with the United States, has fluctuated widely.

Industry Briefs

Dealers report growing brass and copper wire order deferments from customers whose products incorporate steel (farm equipment and home appliances). The nonferrous metals industry is also slowed by the continued walkout of the 30,000-member Mine, Mill & Smelter Workers . . . AFL-CIO Research Dept. says average wage settlements this year have been 7-12 cents an hour with "widely liberalized" fringe benefits . . . Looking for security? All new Federal buildings will have fallout shelters . . . U.S. sales of Japanese transistor radios are expected to double 1.2 million sets sold in 1958 . . . F. W. Dodge reports wide-spread postponing of non-residential and heavy construction projects due to steel strike. August was 11% below recession-strapped 1958 . . . A Miami firm will attempt salvaging $75 million in uranium, molybdenum and chrome ores in 40 U-boat sunk ships off U.S. coasts . . . Auto paper will take down 40% of '59 growth in consumer debt. •

heat treated
alloy steel nuts
selected and tapped
face down
within .002"
face run-out
Such accuracy is easily held on Snow machines. They show up best on hard-to-hold, tough steel parts where accuracy and quick changeover are important. They cut production costs, help you to make reliable deliveries of high quality parts. Snow has 3 types of machines for tapping (see below). On your next job let us show you what the Snow method can do. We invite samples and prints.



SNOW NUT TAPPER (like above). Hopper can select flanged nuts FACE DOWN.

SNOW HORIZONTAL MACHINE For special parts that need clamping. Hopper or hand feed.

SNOW VERTICAL MACHINE For short runs on a quickly changed dial index plate.

Snow Manufacturing Co., Dept. C, 435 Eastern Avenue, Bellwood, Illinois. Telephone, Chicago, EStebrook 8-7142

master **SNOW** *tooling costs*

Use postpaid card. Circle No. 213

Setko's 23 Years of Progessive Engineering Experience Keeps Screws Modern as Tomorrow's Products

SETKO NEWS

Vol. 3, Issue No. 1 — Bartlett, Illinois (Chicago Suburb) — Progress Edition

We Specialize in Solving Puzzling Screw Problems

NEW HOPPER FEEDER QUADRUPLES SET SCREW INSERTION RATES

Labor costs cut by 75%

Changeover from manual to automatic insertion of set screws is now easier and more profitable than ever. More profitable because this new, compact, Setko Hopper Feeder requires less space — and embodies advancements and refinements in design to make for greater operating efficiencies. It is now possible to actually quadruple insertion rates over the hand method, while cutting labor costs by 75%.

Operation of the machine is less complicated than the hand method. All the operator has to do is feed the workpiece to the receiving pad and the machine automatically drives the screw to a predetermined depth. Every screw is uniformly inserted.

Additional savings result from a reduction in rejects and floor loss. Users report "rejects have been cut to almost zero and floor loss has been eliminated!"

More than fifteen years of experience in the design, engineering and manufacture of Hopper Feeders is behind the cost-cutting, production-increasing performance of this new model.

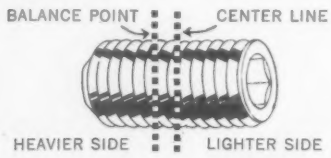
Feeds any type of headless set screw and with any point style

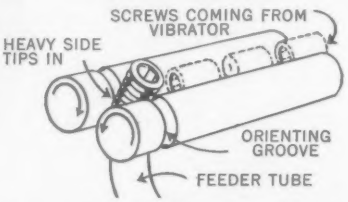
Hex Socket, Fluted Socket, Slotted or Slabbed heads and with any type point, can all be oriented and fed with equal efficiency. Even "specials" can be oriented in most cases.

760

Exclusive orienting mechanism assures perfect positioning of screw every time

It's really a matter of balance... Every type of set screw has a point of balance. Because of the manufacturing methods used it is almost never exact center. This means that from the center of the screw, one end is a little heavier. The object is to get the heavier end to tip *consistently* into the feeder tube. Setko accomplishes this by feeding the screws from the vibrator to the orienting mechanism *where it is literally wafted* on a cushion of friction between two opposingly driven rollers.



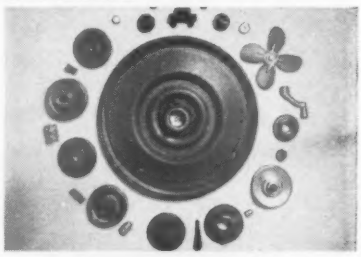


A groove in each roller acts as a balancing point so that no matter which way the screw approaches, head first or point first, the heavier end tips into the groove and falls into the feeder tube.

Many Models Available

In addition to the air-operated table top model shown on this page, Setko has a complete line of Hopper Feeders for use with vertical drill presses, etc. Various type driving and feeding mechanisms are available to assure the right combination for your operation.

Used on a Wide Variety of Products



Automated insertion of set screws is performed on these and many more products. The workpiece is simply fed to the receiving pad and the set screw is driven to a predetermined depth. In most cases the final tightening of the set screw takes place when the component is assembled to the main product. In some cases, the final inserting and tightening take place at one time.

Pays for itself in less than a year

Companies who have bought and are using Setko Hopper Feeders say that, "they pay for themselves in less than a year." In many cases, "much less than a year."

Send the Coupon Today for Full Information

Send your specifications for recommendations and quotations. Ask for Catalog 23 showing the full line of Setko Socket Screw Products.

SETKO Set Screw & Mfg. Co.
705 Main Street, Bartlett, Illinois

☐ Send me complete information on your Hopper Feeding Method.
☐ I am attaching specifications. Please send recommendations and quotations at no charge.
☐ Send Catalog 23.

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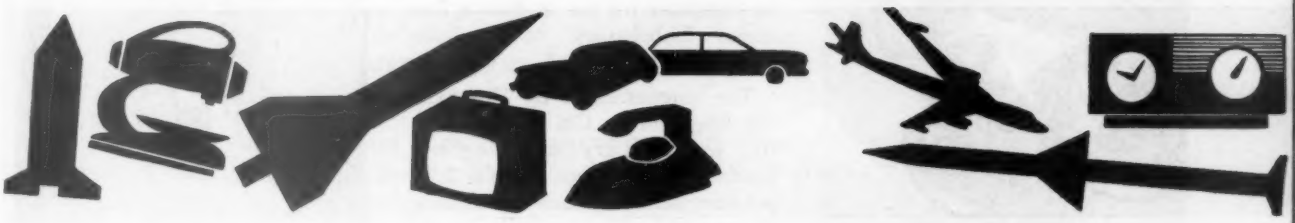
Industry at Work



LEAR CHALLENGES "FOREIGN AGENTS" JEOPARDIZING MISSILE ASSEMBLY

Foreign agents are at work in the avionics industry. Once they get on the "inside," they can deal a deadly blow to some of the most delicate, intricate and precise instruments built by man. The enemy? —Dirt.

And dirt can mean dust, face powder flakes, salt crystals which derive from human perspiration, lint, soot, dandruff—all of those microscopic particles that filter, sometimes invisibly, through the air we breathe.

Lear, Incorporated, in the new manufacturing and assembly plant of its Instrument Division in Grand Rapids, Michigan, is meeting this challenge. The facility has been completely pressurized against the entry of dust when doors are opened. For the assembly of the most critical parts of instruments there are ultra-clean "white rooms" which are said to exceed the sterile conditions in hospital operating rooms. In these rooms, employees wear special nylon clothing. Technicians entering pass through an electric-eye controlled overhead air-washer together with a vacuum system installed in the floor which literally blows the worker clean.

Lear engineers point out that the biggest problem in building missiles is reliability. Drift of a missile off its target could be caused by friction in the gimbal bearings of its gyroscopic instruments. The liquid that "floats" the gyro between the bearing and its shaft prevents friction between two delicate surfaces just as a thin coating of fluid separates the eye from the eyelid.

Clogging the microscopic area between the bearing and its races, a piece of fuzz from a sweater, a particle of smoke (which, after all, is simply soot), a grain of face rouge—any one of those millions of particles people are covered with—could send a missile to a direct hit on an abandoned stone quarry.

One engineer, after seeing under a hypersensitive microscope what cigarette smoke can do to a bearing, gave up smoking.

Lear engineers describe as "rocks" cigarette tars and acids measuring 40 millionths of an inch in diameter. And rouge, being another form of iron

continued

Hospital laboratory? No, the isolated gyro assembly room in Lear's new $5 million aircraft instrument plant, where every step is taken to control dust and temperature.

Vendor-supplied gimbal bearings are inspected under steri-shields. After inspection, parts are cleaned, lubricated and sealed for transfer to assembly areas.

Separating multi-colored wiring leads with a stick, Lear inspector is checking some of the 600 soldered connections in the assembly of a three-axis all-altitude indicator.

oxide, is such a perfect abrasive that it is used to polish glass.

Humidity in the plant is controlled at 45%, plus or minus 2%, to prevent rust. Temperature is kept at 71°F, plus or minus 1°. Ceilings in the gyro and instrument assembly areas are of vinyl-covered acoustical tile. Light fixtures are flush-mounted to guard against dust collecting. They are serviced from overhead catwalks. A high-intensity lighting of 140 foot-candles is maintained at work benches.

WORLD'S LARGEST PERMANENT MAGNET WORKS FOR AEC

The world's largest permanent magnet will help pump liquid sodium in a breeder reactor to be operated by the Argonne National Laboratory to produce electrical power.

The magnet made by The Arnold Engineering Co. of Marengo, Ill., a subsidiary of Allegheny Ludlum Steel Corp., weighs 1720 pounds, and is made of Alnico V material. The overall dimensions of the magnet are 52½ by 36 by 10 inches. It has a gap length of 16½" and a gap volume of 1584 cubic inches. The density at the center of the gap is 1100 gausses. About 500,000 ampere turns were needed to magnetize the unit.

It is customary to use an electromagnet in pumping the liquid sodium in this atomic energy application, but in this instance a large permanent magnet must be used because the magnet will be completely surrounded by the liquid metal.

The sodium used in the reactor acts as a heat transfer medium or "coolant" in much the same way as water can be utilized, but sodium does the job better. The liquid sodium absorbs heat from

within the reactor, then it is pumped outside to heat water in a heat exchanger or boiler.

The magnet will help in the pumping of the highly radioactive sodium at elevated temperatures.

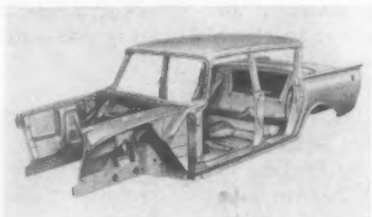
The pumps operate without moving parts. This is achieved by the interaction between a current passing through the sodium at right angles to a strong magnetic field. This interaction produces a force in the sodium when directed through a closed piping system serving as a continuous supply of liquid sodium.

DETROIT AUTO FIRSTS GET "SENSATIONAL SIXTIES" OFF TO A FAST START

Chrysler Corp. claims the industry's most extensive rustproofing process for its 1960 line. A four-year, $18 million project has resulted in a seven-stage system of electronically controlled cleaning and drying, heating and cooling, rinsing, priming and painting along a 2300-foot tunnel taking 102 minutes for each car to travel.

A Chrysler Corp. car (left) is conveyed into a 9000-gallon tank of water-reducible primer paint, the last step of a seven-stage anti-corrosion process. After being soaked to a depth of 18 inches for 90 seconds, the car will be drained and then sent through a painting, baking, sanding and enamelling line.

Chrysler designers give Sally, (right) the plastic mannequin, credit for providing the head and leg room answers for designing seats for women. She's now sitting on the lap of Sturdy Sam, a 150-lb. seat depressor, who helped determine cushion contours and the level of seats above the floor.



9000 WELDS FABRICATED the body of American Motors' Rambler. The pioneer of this method reports unitized construction as offering a car lighter, safer and more free from rattles.

Ford expects to build 100,000 Falcons in 1959. The economy car is 27 in. shorter than the standard Ford and sits six. Vice president J. O. Wright says it has more luggage space, 70% more windshield area, a foot more of rearseat width and 35% better gas-mileage than the smallest American-made "compact" car.

KEYSTONE and Yellow Strand®

working together for 30 years to maintain wire rope leadership —

For more than three decades, Keystone has worked closely with Broderick & Bascom Rope Co., St. Louis, Mo., to produce superior quality wire that meets the ever-changing demands of the wire rope industry.

A good example is the large 3⅛" Yellow Strand "Powersteel" Dragline Rope with a breaking strength of 448 tons. This strong, abrasion-resistant, high-carbon steel wire rope was developed to match the increased capacity, power and speed of today's giant draglines and strip mining equipment.

Sharply contrasting to the big rope is the 1/32", 1 x 7 Galvanized Aircraft Strand—also illustrated—one of the smallest B & B wire ropes.

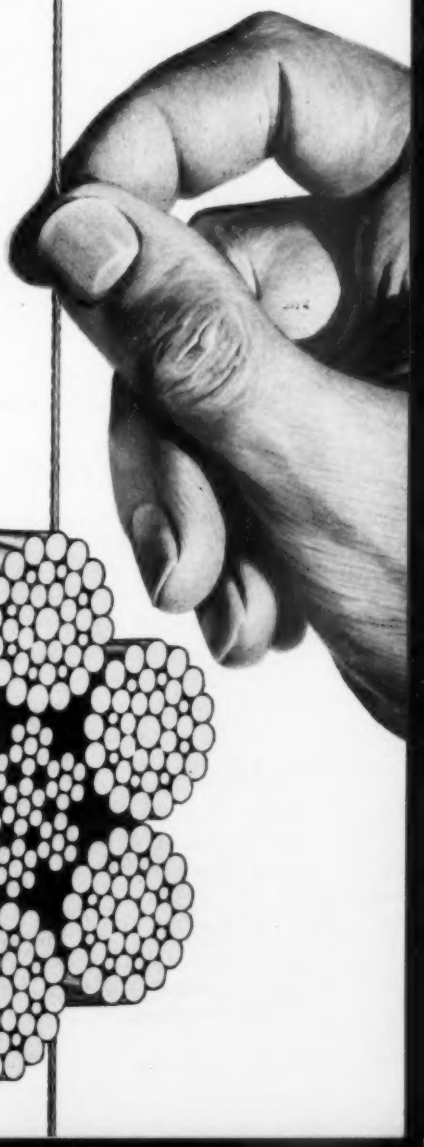
Keystone and B & B engineers together have developed unusual manufacturing methods to produce a wire rope with superior performance.

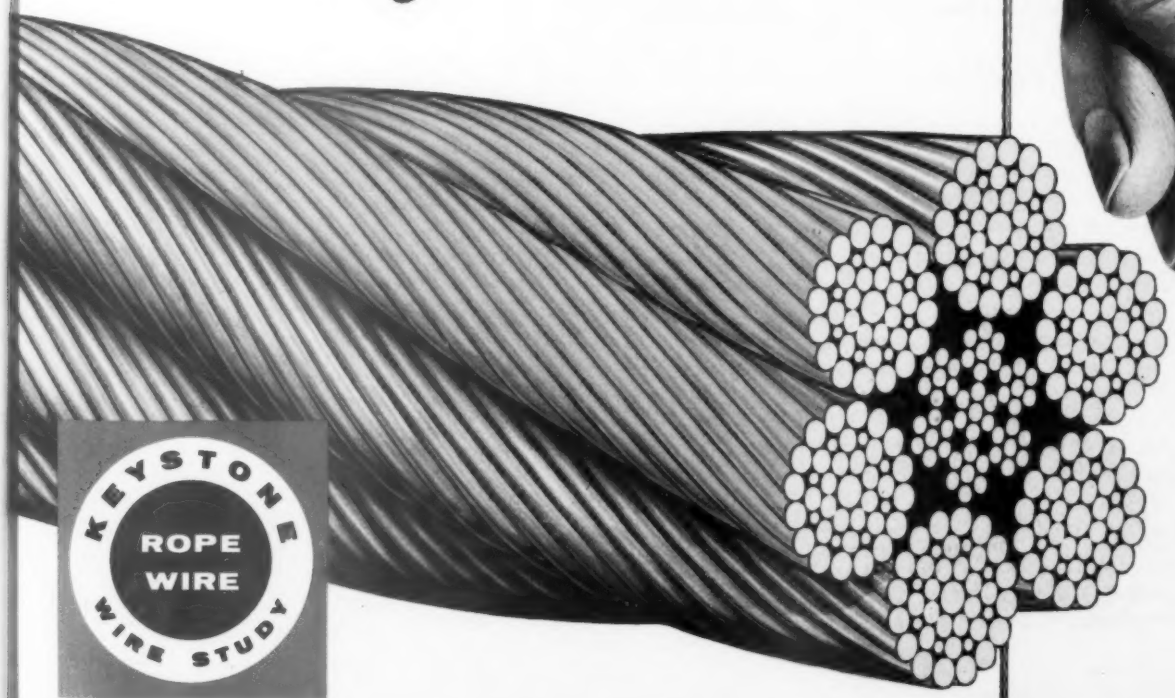
You, too, can enjoy these sales advantages and create customer demand by specifying Keystone Wire wherever wire is used in your products. Call your Keystone representative!

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE
WIRE FOR INDUSTRY

The large wire rope consists of 295 individual wires, laid up into 6 strands of 41 wires each with Independent Wire Rope Core. The small, galvanized aircraft strand is made up of 7 wires.





KEYSTONE ROPE WIRE WIRE STUDY

Count on *Continental* and collect the savings you plan with power driving tools

Fastener faults can quickly foul up the best plans and the finest equipment for high-speed assembly. Defective screws that might "get by" for hand driving can be disastrous to assembly with hopper-feed machines and other power driving equipment.

To get *all* the savings you properly expect from your tooling investment, count on Continental HOLTITE quality standards. Tolerances are matched to the toughest demands for uniformity in every detail. Special tests and trial runs under job conditions are made, as required, to assure trouble-free performance on the assembly line.

You can count on Continental, also, for cost-saving ideas in fastener selection. At your request, a Continental Assembly Specialist will make detailed recommendations.

Write or phone: Continental Screw Co., 448 Mt. Pleasant St., New Bedford, Mass.

CONTINENTAL
SCREW COMPANY, NEW BEDFORD, MASS.
HOLTITE FASTENERS

HY-PRO TOOL COMPANY . . . DIVISION
RESEARCH ENG. & MFG., INC. SUBSIDIARY

HOLTITE PHILLIPS AND SLOTTED HEAD
WOOD • MACHINE • TAPPING
THREAD CUTTING SCREWS
HANGER AND STOVE BOLTS
SEMS • NYLOK
HY-PRO PHILLIPS INSERT BITS AND HOLDERS

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Assembly and Fastening Ideas

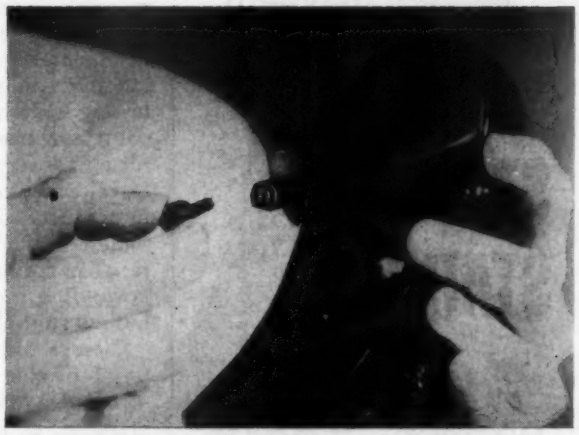
SPRING PIN REVOLUTIONIZES SHOE REPAIR

A versatile fastener—the spring pin— is kicking up a small-scale revolution in shoe repair.

Inserted into the heel of milady's spike-heeled shoes, the slotted tube acts both as a steel spine reinforcement for the heel and as a socket receptacle for mating heel lifts of molded plastic.

One result is sharply reduced heel splitting, bending and breaking, reports the Fitz-On-Heel Corp., Manchester, N.H., which developed the method. At the same time, the Sel-Lok pins made by the Standard Pressed Steel Co., Jenkintown, Pa., make do-it-yourself replacement (snap them in, snap them out) simple.

A hole is drilled almost the full length of the heel and the spring pin is driven permanently into place into the slightly undersize hole. Its end is flush with the bottom of the heel. The molded nylon lift then snaps into the pin.



A plastic lift is being mated with a tubular pin inserted in the heel of the shoe. The new method simplifies repair, strengthens the heel.

INDEXING UNIT SPEEDS AUTO PART BRAZING

A unique self-indexing machine, which silver brazes a tube and flange to a tank, has increased production to a rate of 600 assemblies per hour and, at the same time, has achieved substantial labor savings for a leading automobile manufacturer.

Each of two such automatic units designed and built by Selas Corporation of America, Dresher, Pa., comprises 20 stations for loading, heating, cooling and automatic unloading. The water-cooled, work-holding fixture at each station holds the tube and flange in the proper relationship with the tank, and a device for maintaining the alignment on the flange exerts pressure to assure it being properly seated when the brazing alloy melts. With the accuracy of the seating thus assured, the only operations requiring manual attention are loading, fluxing and braze alloy preplacement, which are being easily handled by two operators.

continued

Fast Shipment FROM WORLD'S LARGEST STOCK of STAINLESS STEEL AN—MS COMMERCIAL BOLTS

SCREWS—Complete range of machine and self tapping with slotted or Phillips recessed heads, both magnetic and non-magnetic.

NUTS—Cap, Hex, Castle, Slotted, Square, Wing, etc.

PINS—dowel, taper, etc. Plus washers, rivets, threaded rod, studs, nails, many more.

"SPECIALS"—fabricated to your specs on extremely short notice.

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ALLMETAL®

Screw Products Company, Inc.

Manufacturers of Stainless Fasteners Since 1929

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A special type of gas-air burner, which combines positive flame geometry with maximum heat release, is used at each heating station, one firing from above, one from below. The multiport screen of the burner breaks the flame front into a large number of small flames and produces a concentrated "flat face" round flame of high intensity, thereby combining heating uniformity with the rapid production rate.

The machine requires only 7-ft. by 8-ft. floor space, enhancing its work capacity with compactness.

CLAMPS DON'T HOLD—BOEING USES WELDED BALL-SOCKET

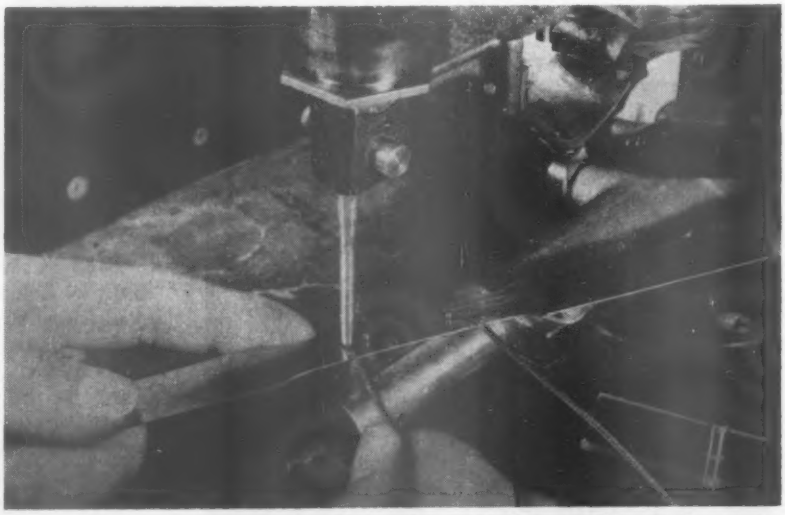
What to do when extensometer clamps won't hold on the hard surface of a high-strength metal alloy? Why, weld some steel balls to the material, and hold the balls in the firm grip of a socket.

This simple answer to a vexing problem has been worked out by research engineers at Boeing Airplane Co. recording load-strain factors on six new alloys and testing them in protracted heat. In testing such metals to the fracture point, engineers of the manufacturing research laboratory at the Developmental Center in Seattle first depended on standard extensometers, which gripped the material in spring-loaded, knife-edge jaws—fine for ordinary purposes but not suitable for the new alloys.

Clamps slipped when the material of the extensometer arms softened its bite; while the tested material, as if by signal, attenuated and moved out from under the clamps. Thus the extensometer, which records on the outside of a test furnace what's happening to an alloy inside—gave no accurate reading.

The answer is the welding of 3/32" diameter balls an inch apart on the specimen. Temperature must be precisely controlled to avoid weld core enlargement in the specimen; and welding force must be light, to avoid forcing the ball into the specimen, creating stress risers and affecting metal flow properties under tension. Scrupulous cleanliness is also necessary.

Ends of the extensometer arms were fashioned into sockets to fit over the balls; and the system was complete—small, neat and with a minimum of tinker-toy gear to interfere with radiation of heat to the specimen. Under the direction of Jack Wilson, inventor of the system, tests have been made on alloys at from room temperature to 1650°F with excellent results in 96% of the tests. •



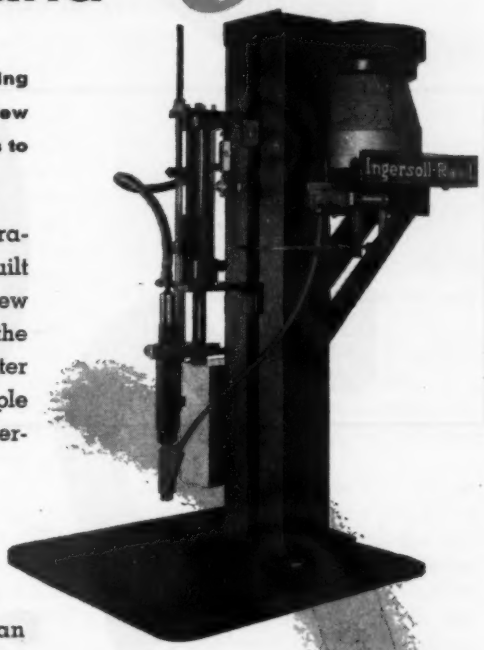
Using modified projection welding technique with a standard spot welding machine, Boeing engineers fuse 3/32" steel balls to test specimen. Note that temperature-recording thermocouples are also welded to the speicmen, instead of being conventionally wired. This provides positive metal-to-metal contact which prevents the thermocouples from coming loose within the extensometer.

for complete flexibility in rapid ***r.a.f.*** *automatic fastening*

the NEW R *r.a.f.* screw driver by Ingersoll-Rand

You get complete flexibility by moving, adding or removing powerheads—by varying screw types or sizes—or by adjusting power ranges to meet different torque requirements.

Now you can automate your fastening operations without buying expensive, custom-built fastening equipment. With the versatile, new R.A.F. Screw Driver, you can run one job in the morning, and a completely different job after lunch. Changing the screw pattern is as simple as loosening and then tightening two powerhead bolts.



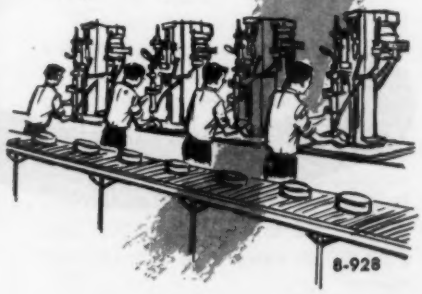
dividends on payroll dollars

Using the new R.A.F. Screw Driver, one man can outperform a half dozen operators using conventional hand held screw drivers. As an example of savings possible with Rapid Automatic Fastening, multiply the yearly wage you pay one operator by the number of operators the R.A.F. Screw Driver replaces. This figure, minus the cost of the R.A.F. Screw Driver, represents your Dividend on Payroll Dollars for the first year alone.

For the full story on Dividend Dollars with Rapid Automatic Fastening, call your local Ingersoll-Rand office today, or write for Bulletin 5266.

✶ in small shops

✶ on assembly lines



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Tools plus AIRengineering increase output per man

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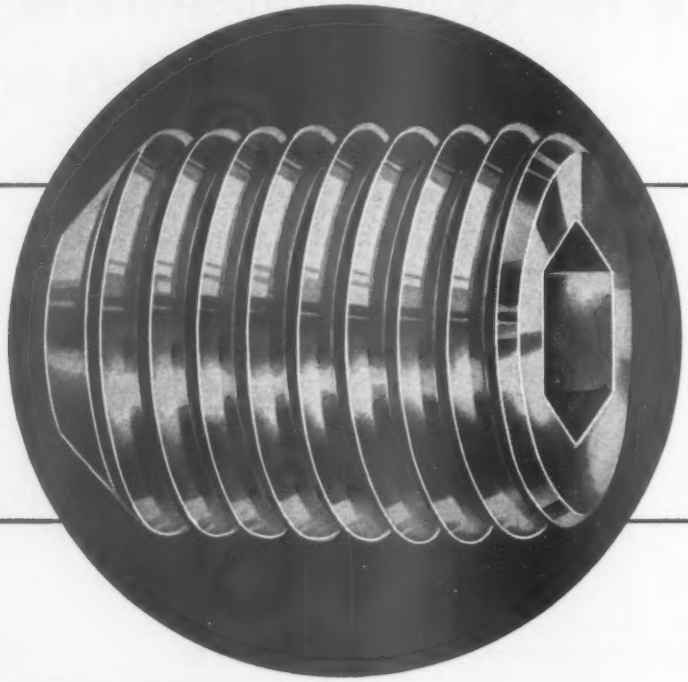
Problem: *"Secure pulley to shaft with set screw. Head of screw should be flush with pulley collar to prevent injury to personnel. Set screw must hold firmly under vibration. Space for tightening and loosening is limited . . ."*



Solution: *HOLO-KROME SOCKET SET SCREWS. Made of special analysis alloy steel heat-treated to 48-52 Rockwell "C" hardness. Hex sockets, forged by H-K's new methods, are scientifically proportioned for highest strength and trouble-free driving. Internal hex socket drive permits tightening and loosening in limited clearance, eliminates protruding, dangerous heads. Threads are Unified Class 3A Fit for maximum holding power under vibration.*

For the finest in Hex Socket Screws . . . for unmatched Same-Day Service, the name to remember is Holo-Krome.

HOLO-KROME
SOCKET SCREWS

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AUTOMATIC SOLDERING MACHINERY DOUBLES PRODUCTION OF MOTOR ARMATURES

Automatic machinery has reduced soldering labor costs 66% and material costs 12% for a large manufacturer of electric motors. Production of motor armatures has more than doubled.

A rotating fixture and automatic solder dispenser speed the assembly of motor armatures.

Formerly three men were required to hand solder each one of 12 wires to eyelets of the commutator. Time required per armature was one minute. Automation had been made impossible due to the lack of uniformity of the position of the eyelets.

Process engineers at Fusion Engineering, Cleveland, studied the problem and eliminated two operators and all hand soldering. (One operator had been employed full time inspecting and resoldering rejected parts.)

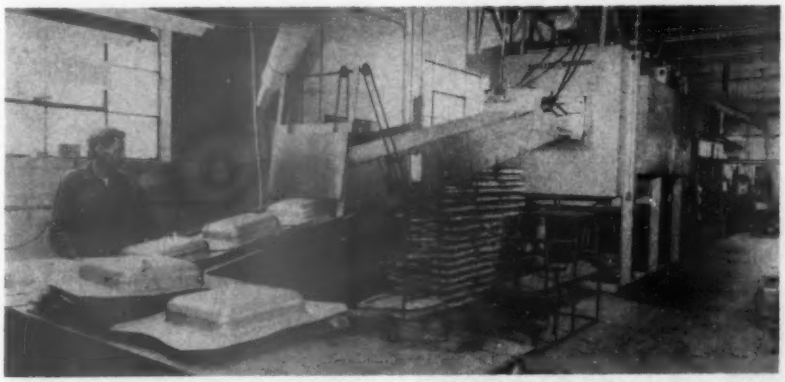
A paste solder dispenser was set up above a rotating fixture. The motor armatures are then individually placed in the rotating fixture. As each eyelet touches the nozzle of the dispensing gun, a dot of Fusion solder—which incorporates both flux and solder in a stable paste form and accounts for the material savings—is ejected onto the eyelet.

A table model induction heater melts and flows the solder.

After all 12 of the eyelets receive a dot of solder, the armature is removed and placed in the coil of a small table model induction heater to melt and flow the solder. Time required under the new set-up? Nine seconds per armature.

MUFFLE-LESS HYDROGEN FURNACE HELPS HI-TEMP CUT STAINLESS STEEL BRAZING COSTS

What is believed to be the largest belt conveyor hump-type hydrogen controlled atmosphere furnace manufactured for commercial purposes—without metal muffles—is being used by Hi-Temp Inc., Northlake, Ill., for high production brazing, bright annealing and atmosphere quenching of stainless steel dies.



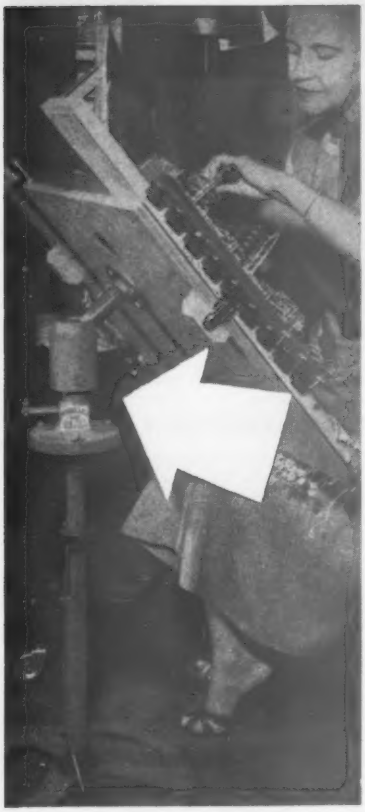
The new GE furnace is here being used by Hi-Temp Inc. for bright annealing stainless steel kitchen sinks after the initial draw. Aircraft components also are brazed in the 71-foot mesh belt furnace.

Large stainless steel dies are bright hardened with an absolute minimum of distortion by this hump-type, 25" mesh-belt electric furnace designed and built by General Electric's Industrial Heating department.

The furnace is 71 feet long and uses a special high purity alumina brick that maintains a continuous dew point of —60 and produces bright, oxide-free results.

"With the new furnace and its larger conveyor belt, we can braze aircraft and missile parts made of 416, 420 and 440 stainless while maintaining tolerances of 0.0005",

continued



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according to E. J. McCrink, president of Hi-Temp.

Many precision electronic components, made of a combination of 18-8 stainless steel and carbon steel, are bright copper brazed without flux in the controlled hydrogen atmosphere. Brazing without decarburizing of air cylinder parts has made it possible to do a better job because a zero chemical change eliminates the need for carbon restoration.

Two-zone control in the new hump-type furnace helps achieve maximum production by maintaining a controlled temperature at the exit end of the furnace. Cold materials entering the first zone do not affect the controlled temperature in the second zone, according to G.E. engineers.

Contamination of the hydrogen atmosphere is minimized by a long and inclined "purge" chamber that angles up to the heating chamber entrance.

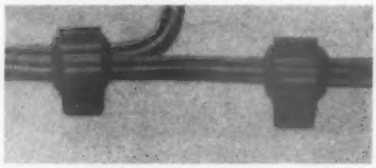
Protective atmosphere consumption inside the elevated heating chamber is kept at a low level because of the hump-type design. The furnace—without metal muffles—is rated 2100° at 195 kw.

SPACE-SAVING NYLON CLIP SPEEDS WIRE TIEING

For many years lacing was the accepted method for securing a harness or other electrical components.

Recently, a number of fastening devices have been developed to fit into mass production operations.

Electrovert Inc., New York City, has developed a miniature version of its line of Insuloid Cradleclips. This U-shaped nylon



cradle can hold a bundle of wires or a component, while an extensible Neoprene clip clinches across the U-opening and locks under the inverted lips of the cradle.

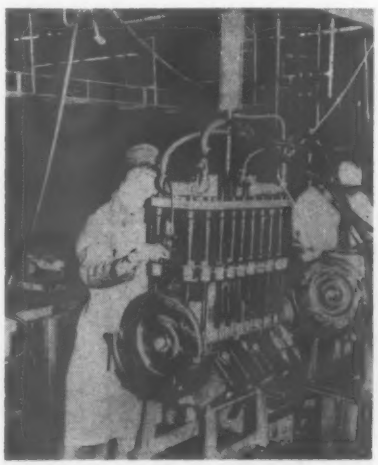
AUTO PLANTS CLAIM SAVINGS FROM POWER ASSEMBLY TOOLS

A new line of multiple-spindle power nutrunners and screwdrivers is effecting significant assembly savings in automotive plants.

For securing fasteners in groups or series, Ingersoll-Rand's air-powered, installed tools are built to drive from 2 to 22 or more nuts, bolts, or screws. Torques range up to 580 ft-lbs.

Savings of $56 daily in labor costs on running four slotted-head screws on a rear pump to a torque of 14 to 16 ft. lbs. are reported by one plant. The machine releases three men from a job for-

continued



This air-powered tool fastens 20 nuts on oil pan assembly simultaneously.

Here a special air tool tightens the shackle bolts on rear auto springs.

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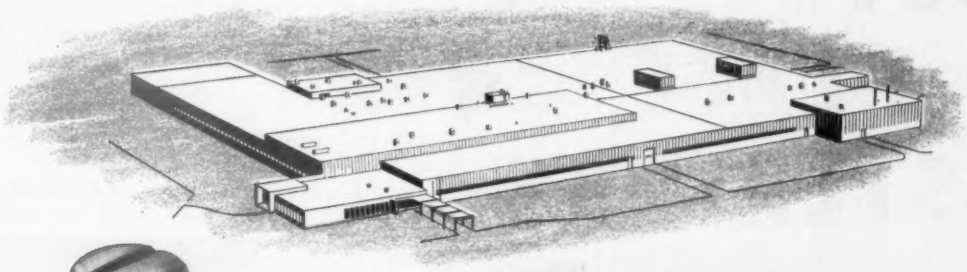

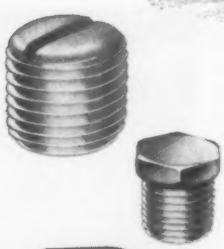

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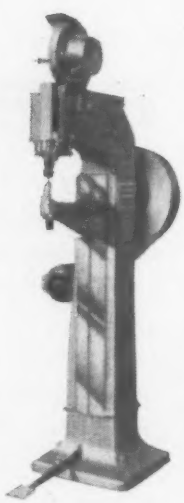

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merly requiring two men to drive the screws and two to check the torque.

In another case, where ten ⅜" nuts secure the transmission carrier to the rear axle housing, a size YC1OB-1 assembly machine releases 1½ men per shift or three men per day for other work and saves $12,000 yearly. It further eliminates a press operation.

Custom-designed for specific jobs, some units are adjustable to handle more than one bolt pattern.

STRAIN GAGE ADAPTED TO MEASURE TORQUE

An ordinary wrench now measures torque by bonding the PhotoStress Gage to its handle.

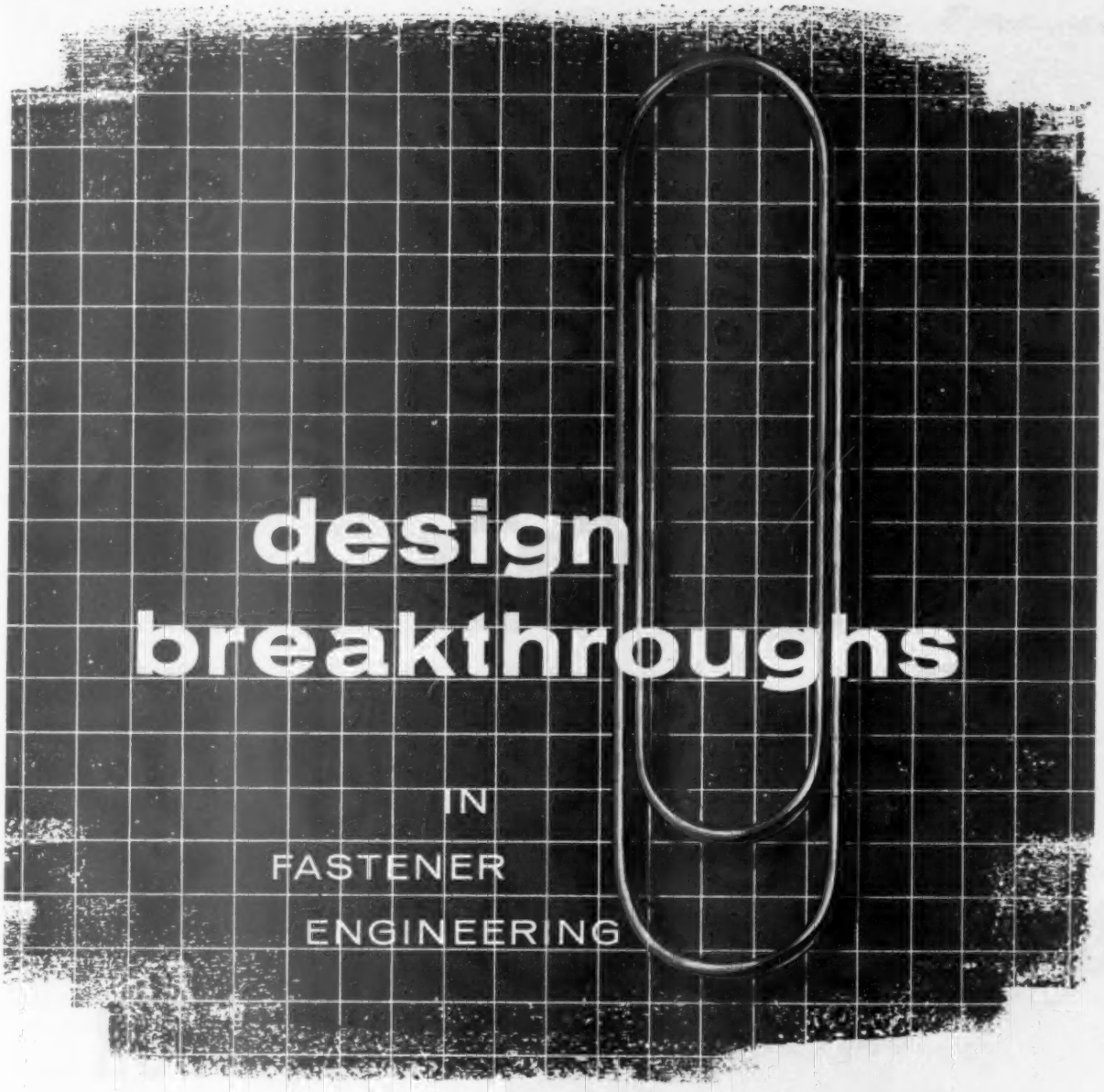
Something new has been added to the research technique of measuring torque, stress, load and pressure by analyzing the changes in contrasting colors caused by birefringent plastic and polarized light.

Tatnall Measuring Systems Co., Phoenixville, Pa., has developed a gage operating on this principle. The rectangular piece of plastic

A special gage indicates torque. Readings are obtained by observing the gage with stroboscopic light while the shaft is rotating.

has a graduated scale with color fringes along its length. Bonded to a structure to which load is applied, the displacement of the fringes is directly proportional to strain.

When used for transducer applications, the gage is calibrated in lbs., inch-lbs., psi. It also indicates misalignment. •



An important breakthrough in fastener design a good many years ago was the common paper clip. And, although DOT is not a manufacturer of paper clips, many a DOT industrial fastener has had an equally revolutionary effect on modern fastening technique. Hundreds of different DOT fasteners have created relatively minor revolutions in specific industries.

A DOT fastener may save a few man-minutes of labor. It may save material. Or it may improve product performance and hence saleability. But multiply each small improvement by the units in a true mass-production operation and the savings really pile up to impressive proportions.

Rather than spend your own design staff's time on fastening problems, it might pay you well to call in DOT. You'll have at your service a design and production organization with large-scale facilities for genuine mass-production of special-purpose fasteners and self-fastening devices of all kinds.

Supplementing the Carr Fastener Company are a number of other plants which form the United-Carr Fastener group. They are located in the principal production centers of the United States, Canada, England and Australia. Your nearest United-Carr field office (see below) is no further away than a telephone call from your desk.

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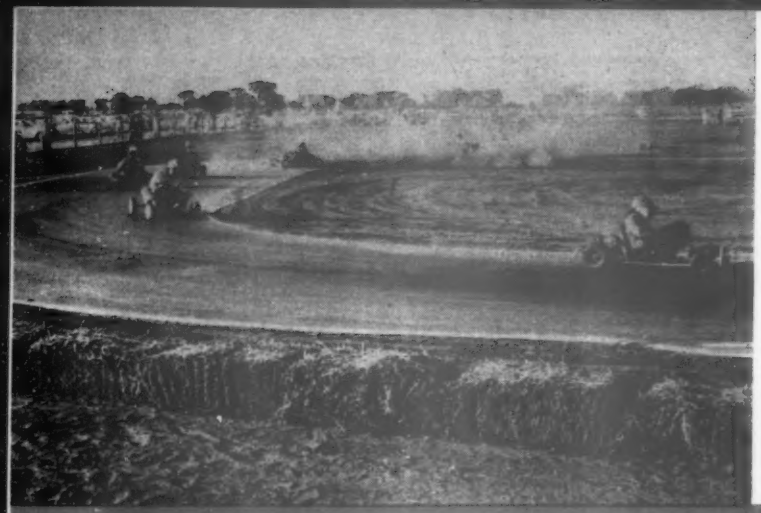

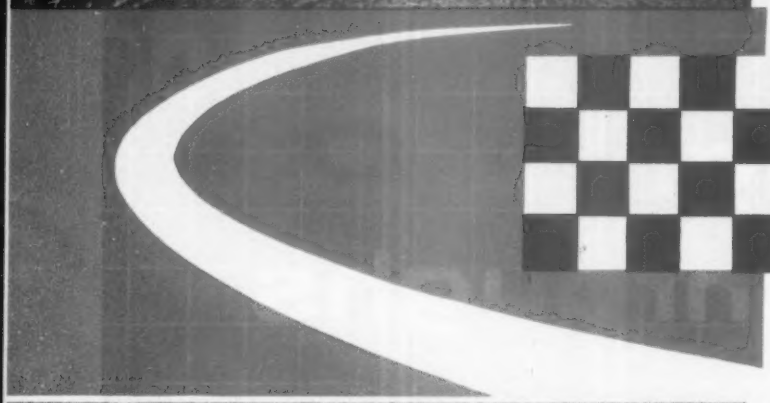

GO KART ENGINES BUILT FOR RUGGED DEMANDS

by **Darrell Ward**
Engineering Editor

Though the simplest of automotive vehicles, the Go Kart requires an engine which can stand up under rugged racing conditions, plus constant overhauling by hobby-mechanic-owners. This article tells the role of five fasteners in the overall quality of Clinton's "popping Panther" engines.

Go Karting is big business. There was no doubt about it once we visited the Clinton Engine plant at Maquoketa, Iowa, and a couple of Kart builders who use the little Clinton Panther on their assemblies.

A Go Kart, as all well-informed engineers and sports fans know, is the simplest form of automotive vehicle. Through a former employee of the Dusenberg plant, we learned that prototypes date back to the early 1920's as an extra-curricular activity around the Big 500 track. Many famous names in a list of interested people include Barney Oldfield, Louis Schwitzer, Fred Offenhauser, Charlie Mertz, their relatives and friends.

While Karting dates back beyond the memory of most present day enthusiasts, widespread activities in the modern dress spring mostly from more streamlined developments in California a couple years ago. The modern vehicle officially designated "Go Kart" is a rigid tubular frame with four wheels, steering, a seat and an engine. The wheels are equipped with pneumatic tires. The front end geometry is a simplified copy of big cars. The seat may be richly upholstered. But the engine is the heart of the Kart and the basis for this whole new industry. It must be rugged.

Clinton admits that the industry has come up from nothing in the past two years and began booming before they fully realized the potential. They can list over 150 customers who manufacture from 2 to 200 Karts a day.

Last Spring, assembly lines ran day and night and still couldn't supply half the demand. Clinton is only one of eight or ten major builders of engines for the little hot rods. Yet, they have been shipping an average of 10,000 per month since November of last year.

Clinton's A-400 series engines were originally developed for low-powered equipment, lawn mowers, pumps, generators and devices which can operate satisfactorily on a medium speed 2½ hp engine. Modified versions for the Go Kart industry are equipped with ball or roller bearings and other features to withstand the speed and punishment of a rigid frame zooming around a track in excess of 30 to 40 mph.

The A-490 is claimed to be the most popular, economical and reliable engine for Class "A" Karts. Since the popping little Panther contains 94 separate parts, give or take a couple for various modifications, it was impossible to examine details of all fastening problems. We settled for five. Their special design, specifications and purposes will illustrate the built-in quality and reliability of the mass-produced, low-priced unit..

The five fasteners selected are: main ball bearing retainer ring, connecting rod screw with special lock washer, reed plate-carburetor mounting stud, bearing plate cap screws, and flywheel lock nut.

Perhaps the most significant modification in the A-490 was replacement of bronze sleeve bearing

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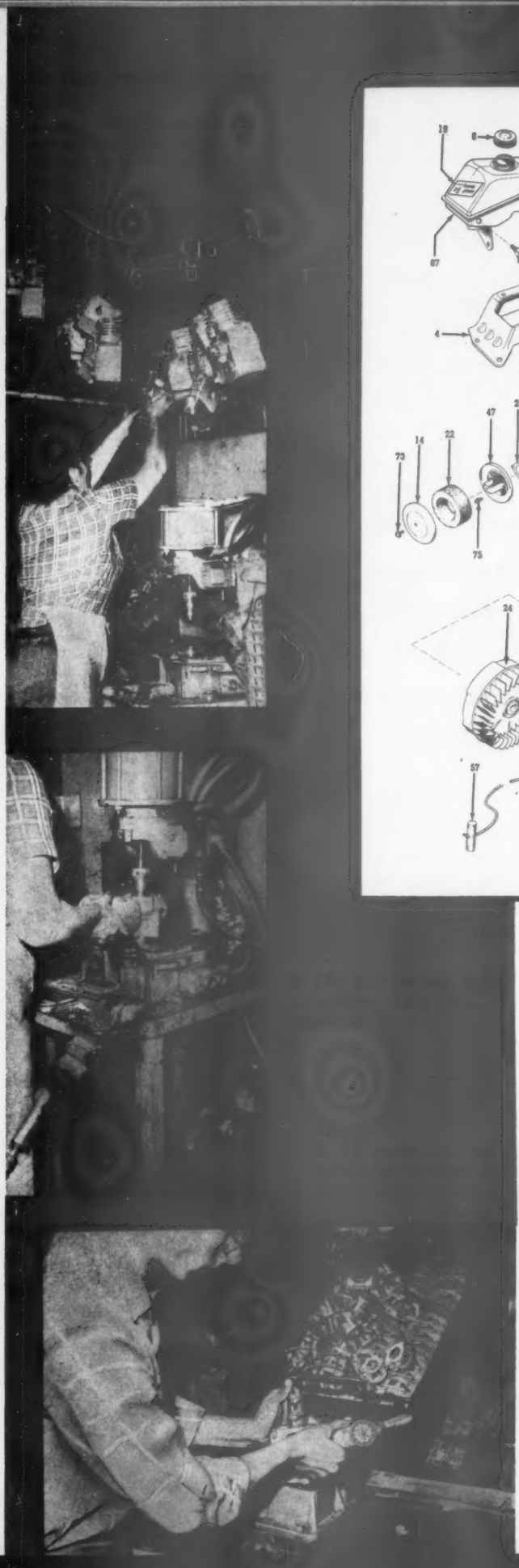
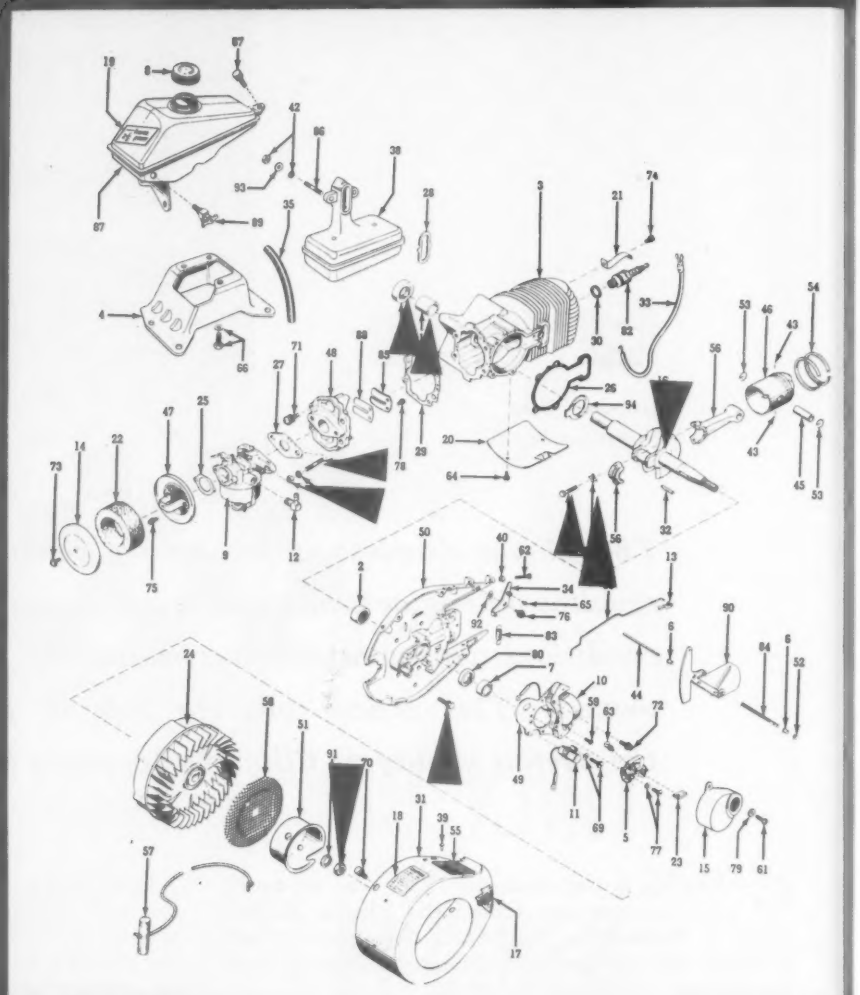




Exploded view shows 94 separate parts of engine made by Clinton for the Go Kart industry. Parts described in detail in this article are indicated by the color arrows. These include five fasteners selected to illustrate the built-in quality of the engine.

(1) and seal (81) with a standard ball bearing. (See exploded view for numbered parts.)

The first worker begins assembly by removing one of the die cast aluminum blocks (photo A) from the continuously running overhead conveyor.

The ball bearing is pressed into the block (photo B). This bearing is a stock item supplied by any of six major vendors.

The bevelled edge retainer ring is slipped into its groove from inside (photo C). The bevelled edge provides for positive locking against the bearing as the ring seats itself in the groove.

After piston and rod assembly is pushed up into the cylinder, the crankshaft is pressed into the bearing, aligned and secured by the connecting rod screws (60) with lock washers (37). The screws are air-driven (photo D) and immediately torqued to 35-45 inch pounds (photo E) while still acces-

sible. The special lock washer tabs are turned over to make this fastening complete.

The connecting rod screw is a 10-24-70% lock-thread type, specified with a minimum tensile strength of 100,000 psi, hardened to Rockwell C 23-30. This is an SAE grade 5 screw, class 2B fit. It must be a trimmed hex head with 0.021" maximum fillet radius.

The lock washer is a special, designed by Clinton engineers to add an extra safety factor under heavy duty service. For practical purposes, the lock-thread screw would suffice. However, extra precautions are necessary in the case of Go Kart enthusiasts who are inveterate hobby-mechanics. These ambitious customers are constantly tearing down and overhauling, or modifying their engines to soup them up for new competition—or merely to keep them in trim for normal class events. It is easy enough for some of these do-it-yourself boys to neglect proper torquing of the screw. If so, the lock washer, with its turned over clinching tabs, may save an engine in the heat of spirited competitive running.

The lock washer is supplied by an outside vendor, stamped from Clinton-owned dies on a sub-contract basis. It is punched from 20 gage c.r.s., then a phosphate coated by Clinton.

The reed plate-carburetor mounting studs (86) are run up with a reversible driver set for 60-65 inch pounds torque (photo F). Nuts (42) are run up to the same torque range. Practically all nuts on these engines are common steel, but the studs are special to Clinton's design. They are made of SAE B1112 steel or equivalent, non-heat treated, with Parkerized finish. Engagement in the aluminum block is over a 0.54" length of ¼-20 UNC-3 thread. Nuts are applied on the ¼-28 UNF-2 threaded end.

This design has been considered both reliable and convenient for the Go Kart users who frequently remove or replace carburetor and reed plate components.

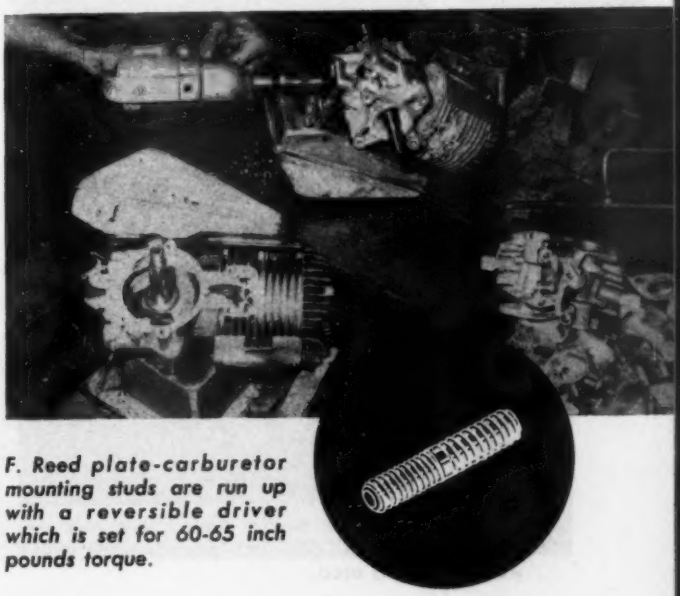
There are six bearing plate hold down cap screws (68), all driven simultaneously by a special multiple spindle driver (photo G). These lock-thread screws also are SAE grade 5, specified at a tensile strength of 120,000 psi and hardness at Rockwell C 23-30. Threading is ¼-20-70%. Again, the hex heads must be trimmed, not indented. The screws are later torqued to 75-95 inch pounds.

Special cadmium or zinc plated steel lock nuts (41) are run up on the ½-20 UNF-2B rolled thread of the crankshaft (16) with an impact wrench, then torqued to 200-250 inch pounds (photo H) if the cast iron flywheel is used, or 350-400 inch pounds against the aluminum flywheel.

An interesting feature of quality control for all torquing is that no mechanics keep torque wrenches of their own. Torque wrenches are supplied by the gage department, the same as plug gages or other precision instruments. Wrenches are checked out by each worker at the beginning of a shift and checked back in when he leaves.

C. The retaining ring is slipped into its groove from the inside. Its bevelled edge locks against the bearing.

D. The crankshaft, which is pressed into the bearing and aligned, is secured by air-driven connecting rod screws and lock washers.



F. Reed plate-carburetor mounting studs are run up with a reversible driver which is set for 60-65 inch pounds torque.

G. Six bearing plate hold down cap screws are driven simultaneously by a special multiple spindle driver. The lock-thread screws have a tensile strength of 120,000 psi.

H. Special cadmium or zinc plated steel lock nuts are torqued to 200-250 inch pounds when a cast iron flywheel is used.

Assembly of Go Kart Engines, continued

Each torque wrench is inspected, tested and adjusted if necessary, when returned to the gage room (photo I).

This system provides accurately adjusted torque wrenches for every operation, every worker, and on every shift. While this may be expensive to establish, Clinton finds it ideal for maintaining uniform reliability in the assembly of mass-produced engines. Even if this were for nothing more than the 10,000-per-month output of Go Kart engines, it still would be a worthwhile investment to Clinton's way of thinking.

All tapped holes are checked with thread plug gages at the time of each machine operation. When the engine block and other parts arrive at the assembly line, they have been inspected to meet specifications.

Bill Courtney, liaison engineer, explained that all threaded fasteners in aluminum are designed with a minimum length of thread engagement equal to the diameter of the screw. Most holes, however, are of greater depth. He said that because aluminum is ductile and will flow, while cast iron is brittle and will crumble, there should be less trouble with threaded fasteners in an aluminum block than in cast iron. This is, of course, provided normal care is taken to avoid damaging the threads.

Torque is established on SAE requirements according to grade and size of each fastener. Most are common grades 1 and 2, but grade 5 is specified for critical fastening as in the case of connecting rod screws and flywheel nuts.

Clinton's engineering standards specify the following torque ranges to be maintained in assembly:

Unspecified parts to be torqued to a range of 10-20 inch pounds.

Spark plug	275-300
Flywheel nut with aluminum	350-400
Flywheel nut with cast iron	200-250
Bearing plate hold down screw	75- 95
Connecting rod screw	35- 45
Reed plate to cylinder block screw	60- 65
Carburetor to reed plate screw	60- 65
Blower housing hold down screw	65- 70
Muffler hold down screw	40- 60
Magneto coil & lamination hold down screw	50- 65
Engine adaptor flange to cylinder block screw	125-150
Nylon elbow in carburetor, long inlet boss	7-8 turns
Nylon elbow in carburetor, long inlet boss	15- 30
Nylon fitting in fuel tank (installation torque)	30- 40
Rotor attachment screw	35- 45
Magneto breaker plate screw	18- 32
Magneto breaker terminal screw	12- 18
Magneto condenser screw	20- 30
Engine base to cylinder block screw	125-150

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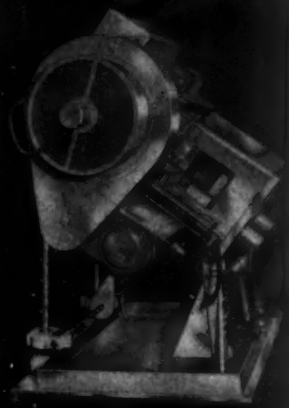

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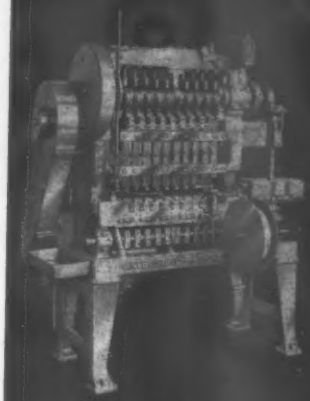

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Assembly of Go Kart Engines, continued

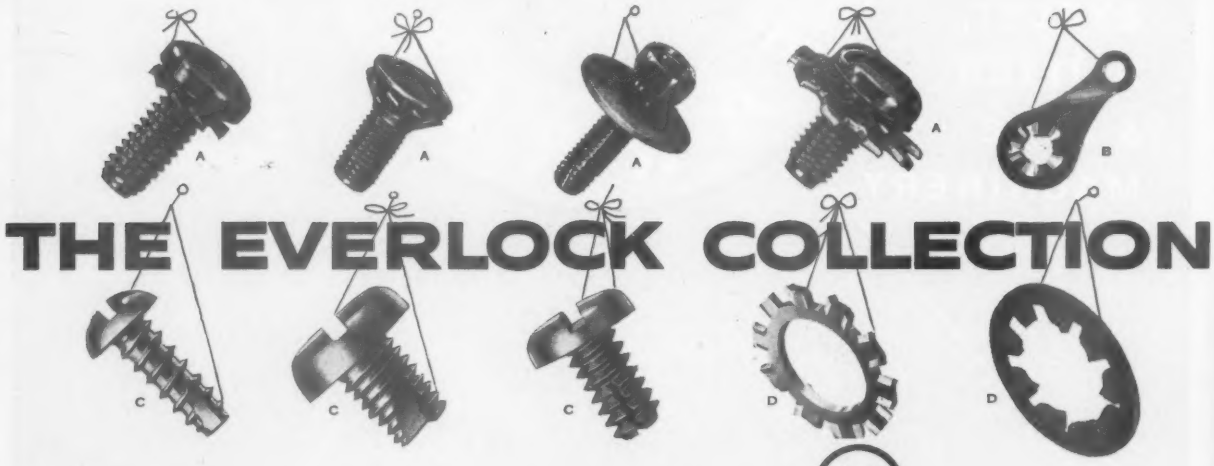
Oil seal installation tolerance ranges from flush to 0.015" recessed. Bearings are lubricated with motor oil only for assembly. Permanent lubrication of precision parts is provided by colloidal graphite dispersion.

From this examination of assembly techniques and engineering specifications, it can be seen why Clinton engines are popular with Go Kart enthusiasts. These little power plants are put together by high-speed economical methods, but are built for rugged use once they leave the plant.

Walden Wright, assistant sales manager, looks ahead for optimistic prospects in the Go Kart industry. He believes peak interest will grow rapidly and hold steady for long time . . . gradual change from slow Karts for children to medium speed for general family, to fast rugged units for serious racing . . . Karting to become more serious adult interest than first supposed, mostly amateur racing . . . widespread publicity will reflect back to manufacturers before next Spring . . . many more tracks or other facilities for running Karts . . . once tried, a Kart sells itself to the average adult male who finds an aggressive outlet in sport.

One point we can solidly confirm. This writer took a few laps at almost full throttle around the Fairgrounds track near Clinton's plant and became aware of one fact. The Go Kart bug can bite—but hard! Try it if you don't believe us. •

1. Each torque wrench is inspected, tested and adjusted, if necessary, when returned to the gage room at the end of each assembly shift at the Clinton Engine plant.



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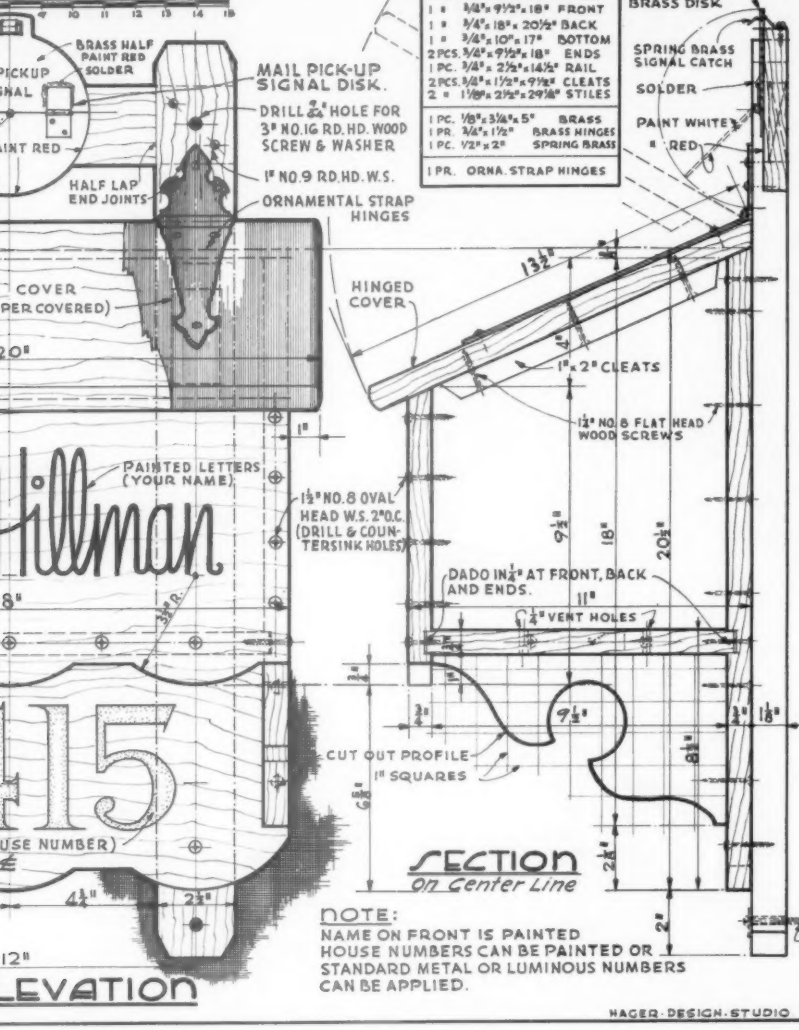
Receiver


BRASS HALF PAINT RED SOLDER
MAIL PICK-UP SIGNAL DISK.
DRILL 3/32" HOLE FOR 3" NO.16 RD. HD. WOOD SCREW & WASHER
1" NO.9 RD.HD.W.S.
HALF LAP END JOINTS
ORNAMENTAL STRAP HINGES
HINGED COVER
PAINTED LETTERS (YOUR NAME)
1½" NO.8 OVAL HEAD W.S. 2"O.C. (DRILL & COUNTERSINK HOLES)
1" SQUARES
USE NUMBER)
ELEVATION
1" × 2" CLEATS
½" NO.8 FLAT HEAD WOOD SCREWS
DADO IN ¼" AT FRONT, BACK AND ENDS.
¼" VENT HOLES
CUT OUT PROFILE
4 - 3" NO.16 RD.HD. WOOD SCREWS & PLATED WASHERS
HALF ROUND BRASS DISK
SPRING BRASS SIGNAL CATCH
SOLDER
PAINT WHITE
" RED

MATERIAL LIST.

1 PC.	3/32" × 13½" × 20"	COVER
1 "	¾" × 9½" × 18"	FRONT
1 "	¾" × 18" × 20½"	BACK
1 "	¾" × 10" × 17"	BOTTOM
2 PCS.	¾" × 9½" × 18"	ENDS
1 PC.	¾" × 2½" × 14½"	RAIL
2 PCS.	¾" × 1½" × 9½"	CLEATS
2 "	1⅛" × 2½" × 29⅛"	STILES
1 PC.	⅛" × ¾" × 5"	BRASS
1 PR.	¾" × 1½"	BRASS HINGES
1 PC.	½" × 2"	SPRING BRASS
1 PR.	ORNA. STRAP HINGES	

SECTION
On Center Line

NOTE:
NAME ON FRONT IS PAINTED
HOUSE NUMBERS CAN BE PAINTED OR
STANDARD METAL OR LUMINOUS NUMBERS
CAN BE APPLIED.

INFORMATION

- IS YOUR PET PEEVE ONE OR ALL OF THE FOLLOWING? SOGGY, RAIN SOAKED NEWSPAPERS... STRUGGLING TO RETRIEVE YOUR JAMMED MAIL FROM THOSE SHARP EDGED TIN BOXES.. MAGAZINES ALL OVER THE PORCH... RUST STREAKS RUNNING DOWN THE WALL, THEN THIS PROJECT IS DESIGNED ESPECIALLY FOR YOU.
- YOU DONT HAVE TO BE A COUNTRY SQUIRE WITH A BIG ESTATE; THIS DELUXE JOB WILL BE THE ATTRACTION ANYWHERE, PROUDLY TELLING THE WORLD WHO LIVES HERE AND THE STREET OR RURAL ROUTE NUMBER TOO.
- IT CAN BE SUPPORTED ON A 4"×4" POST, FASTENED TO THE FENCE NEAR THE GATE OR TO THE HOUSE OR PORCH AT THE FRONT OF THE HOUSE.
- SET BOX 4 FEET ABOVE THE GROUND AND BE SURE TO FACE IT TOWARDS THE STREET. WHEN IT IS UP TAKE A SNAP SHOT & SEND ME A PRINT. I'D LOVE IT.
- IF A REAL RUSTIC EFFECT IS WANTED USE CYPRESS NATURAL..IF TO BE PAINTED RED CEDAR OR REDWOOD.. HAVE A SIGN PAINTER DO YOUR NAME AND HOUSE NUMBER. TRY THE CHROME PLATED "ROCKFORD-PHILLIPS" SCREWS FOR STRENGTH & SPARKLE.

Hery.

"ROCKFORD-PHILLIPS" WOOD SCREWS

4	3" NO.16 ROUND HEAD	2 DOZ.	1½" NO.8 FLAT HEAD
4	1" NO.9 " "	1	½" NO.5 ROUND "
2 DOZ	1½" NO.8 OVAL "		(Chrome or Cadmium Plt)

Hobby-neering

SERIES NO. 9

PROJECT 10

MAKING THESE PROJECTS TO SELL IS STRICTLY FORBIDDEN

Designed by HAGER OF ROCKFORD

HAGER-DESIGN-STUDIO ROCKFORD, ILLINOIS

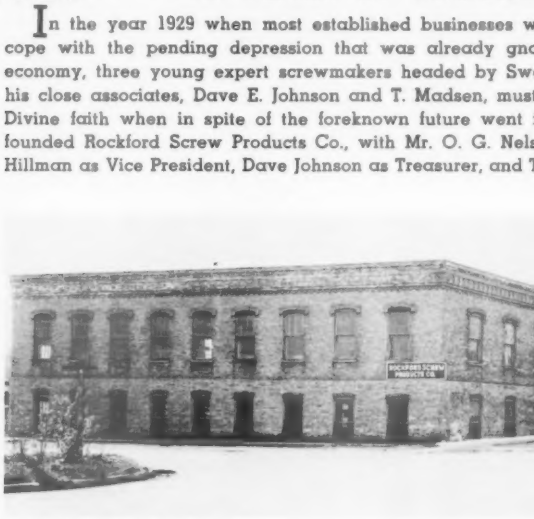
"ROCKFORD"®
Screw Products Co.

Rockford, Illinois

MONTH

1929 ★ ★ 30 YEARS OF PROGRE

In the year 1929 when most established businesses w
cope with the pending depression that was already gno
economy, three young expert screwmakers headed by Sw
his close associates, Dave E. Johnson and T. Madsen, must
Divine faith when in spite of the foreknown future went
founded Rockford Screw Products Co., with Mr. O. G. Nels
Hillman as Vice President, Dave Johnson as Treasurer, and



Original Railroad Ave. Plant

With urgently needed money that was very scarce, relo
who had confidence in this enterprise were solicited to inve
so that the needed expensive machinery and equipment co
erations began in February 1929 in an old factory building
Rockford, Illinois.

Progress was slow but steady, so that by 1934 the old b
burst at the seams for lack of space. An empty manufactur
Street was purchased then and all operations moved to this
now our General Offices and Plant #1, although many addi
to date. Many harrassing conditions and discouraging e
constantly, yet the determination and the will to succeed
from defeat.

(CONTINUED ON BACK PAGE)

ROGRESS ★ ★ 1959

sinesses were wondering how to
lready gnawing on our national
led by Swan Hillman and two of
dsen, must have been guided by
ure went into a partnership and
O. G. Nelson as President, Swan
urer, and T. Madsen as Secretary.

1929

scarce, relatives and close friends
ted to invest in the new company
uipment could be purchased. Op-
y building on Railroad Avenue in

4 the old building was starting to
nanufacturing plant at 2501 Ninth
ved to this new location, which is
many additions have been added
uraging experiences loomed up
o succeed kept this new business

(CONTINUED FROM PRECEDING PAGE)

Growing pains were again experienced in 1943 when another vacant factory building with 9 acres of ground at 612 Harrison Avenue was bought, to be known as Plant #2. Three large additions that now cover most of the nine acres followed in rapid succession. This now seemed to be the ultimate in space needed, with other rented storage space in warehouses nearby to take care of raw materials, machinery, and finished product stock.

General Office and Plant No. 1 1934

In 1951 a tract of land comprising 35 acres was purchased and plans drawn for a building. In 1953 this building known as Plant No. 3, was completed and equipped with the latest and most efficient machinery and equipment possible to produce quality threaded fasteners. This comprised a total of 125,000 sq. ft. of production space. In 1958, the first addition of another 80,000 sq. ft. was added and completed. The second addition of 130,000 sq. ft. is now under construction and will be completed in 1960. From the small 10,000 sq. ft. in 1929, Rockford Screw Products Co. has grown to one of the major manufacturers of Quality Controlled "Threaded Fasteners" with a total of 710,000 sq. ft. of production floor space is quite an accomplishment in 30 years.

Plant No. 2 1943

Former officers of the company, Mr. T. A. Madsen, Mr. Dave E. Johnson and Mr. O. G. Nelson, are deceased. Mr. Swan Hillman, is active as Chairman of the Board and President, of, this ever expanding company.

Plant No. 3 1953

Rockford Screw Products Co. and the 1400 employees, give their gratitude and appreciation to you, the customer who, are responsible for our 30 years of progress and achievement, in the "Threaded Fastener" Industry. We thank you for our Success.

ROCKFORD SCREW PRODUCTS CO.

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ROCKFORD SCREW PRODUCTS CO. Rockford, Illinois
Hobby-nizing with ROCKFORD
"ROCKFORD" HOME WORKSHOP PROJECT of the MONTH

PROJECT of the
"ROCKFORD"
Rockford, Illinois

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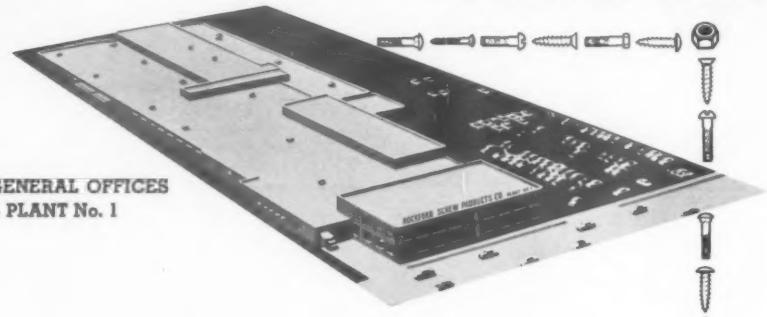
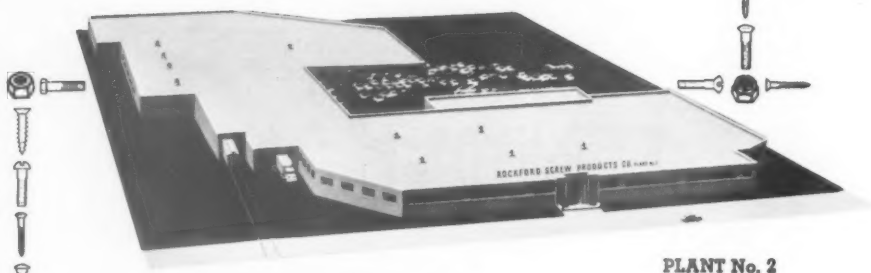
4-9441
TELETYPE
R.K. 7603

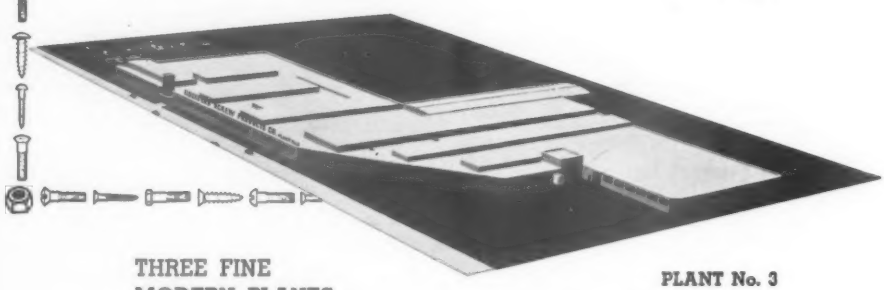
"ROCKFORD"®
Screw Products Co.
2501 NINTH STREET - ROCKFORD, ILL.



GENERAL OFFICES
& PLANT No. 1



PLANT No. 2



PLANT No. 3

THREE FINE
MODERN PLANTS
PRODUCING "ROCKFORD" QUALITY CONTROLLED
THREADED FASTENERS FOR AMERICAN INDUSTRIES.

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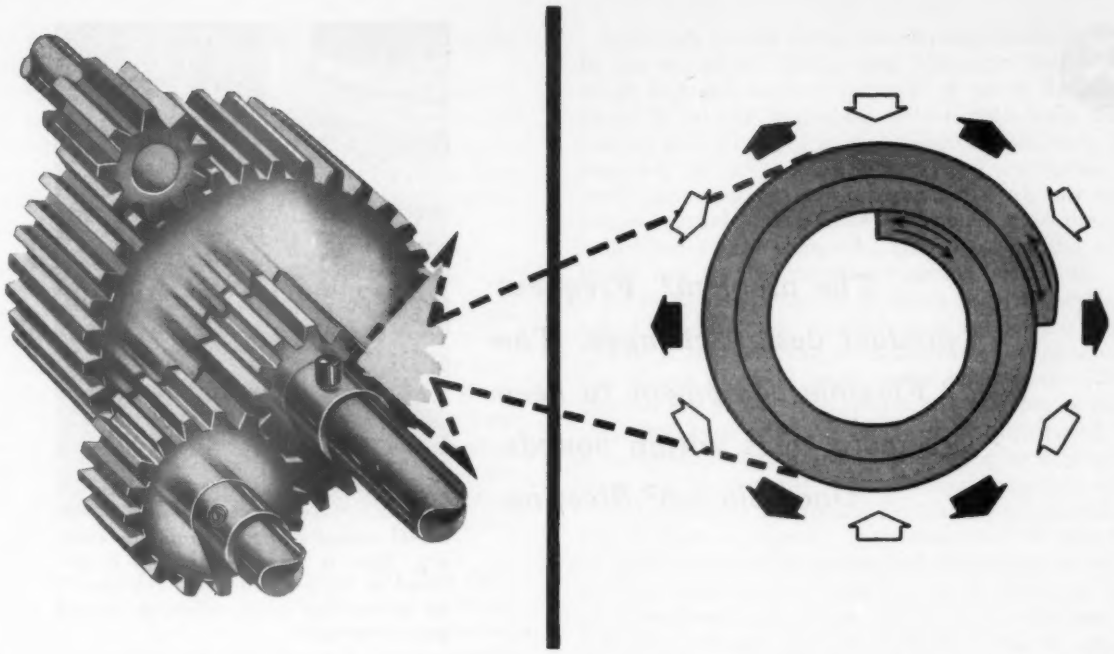
ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois

"ROCKFORD"®
HOME WORKSHOP
PROJECT of the
MONTH

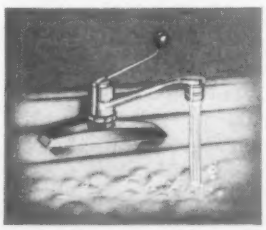
ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois
with ROCKFORD
PROJECT of the MONTH



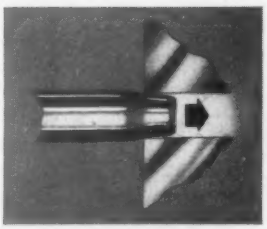
This spring pin's strength . . . comes from true spring *coils*

Full 360° radial spring action gives SPIROL true spring pins the ability to withstand repeated, heavy shock and vibration. When compressed, the unique spiral coils distribute stress evenly throughout the cross-section. There is *no stress concentration* at any point — no critical cross-section even with non-heat-treated metals. SPIROL's novel design gives you *all* the *cost-saving* benefits of a true spring pin.

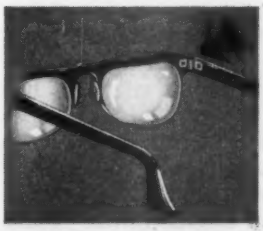
SPIROL gives these unique advantages



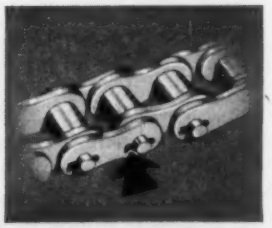
Non-heat-treated metals — such as low-cost brass, copper, nickel stainless steel — can be used in SPIROL true spring pins. Less resilient metals flex without failure, because there is no concentration of stress.



Wider hole tolerances eliminate reaming, reduce drilling rejects, cut production costs. Both plus *and* minus tolerances are allowed because of SPIROL spring pin's greater flexibility in expansion and compression.



Miniature sizes retain flexibility and strength of the spiral cross-section. SPIROL is the only spring-type pin made in miniature diameters: 1/32" — .039" — 3/64" — .052". Standard diameters up to 1/2" in stock.



Shock resistance — extremely high resistance to shock, shear, and vibration permits use of "medium duty" SPIROL pins in the majority of applications. Heavy and light duty SPIROL pins are also available in stock.

FREE! *Write for complete literature on* SPIROL *spring pins, including price list.*

®SPIROL *the true spring* PIN

C. E. M. COMPANY • 146 SCHOOL STREET • DANIELSON, CONNECTICUT

Phone: PRescott 4-2411

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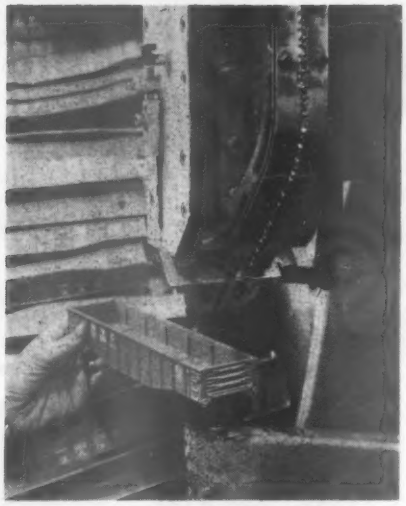
The problem? Frequent product design changes. The need? Flexible equipment to keep assembly costs within bounds. One solution? Riveting.



Lionel assembles its toy trains by riveting. Here a car superstructure is fastened to the undercarriage. The rivet is set away from work, allowing running gear to swivel.

HOW LIONEL ANALYZES TOY TRAIN ASSEMBLY

In the toy industry, factors which affect the selection of assembly equipment include speed of operation, low capital investment, and adaptability of the equipment to a variety of materials and products. It was these factors which originally led the Lionel Corporation, of Irvington, New Jersey, to select automatic riveting as the process for assembling many component parts for their toy trains.

Since nearly 40 million semi-tubular and tubular rivets are used each year in their trains, and because competition mandates brief design life, Lionel is always seeking refinement of their assembly techniques. Some of the refinements at Lionel have been cited by the Tubular and Split Rivet Council as excellent examples of how engineers can obtain flexibility of assembly with high-speed riveting equipment.

Behind Lionel's reliance on riveting as a basic method of assembly is still another consideration: the ability to adapt the same machines to different components and materials with a minimum of change-over and tooling. This doesn't mean that one model will handle the complete variety of rivet sizes and operations required in the plant; such is far from the case. It does mean, however, that the same machines can often be used for different products and parts, or can be retooled quickly.

Like many other manufacturers of toys and other products—automobiles and appliances being notable examples—Lionel utilizes molded and formed plastic components where they result in improved operational and/or mechanical properties, or where they provide the characteristics of metallic parts at a lower cost. Normally, this would require a change in assembly methods; with riveting, the conversion can be made without difficulty.

An example of this is the "Lockon" train component. This comprises a clip, terminals and a ground mounted on a fiber base that snaps onto the track for the power connection. Lionel production engineers designed a steel plunger and toggle fixture, added it to a conventional double-spindle riveting machine. This set-up permitted the Lockon assembly to be made in a single operation at a rate of four a minute.

A vertical shaft about 16 inches in height is mounted in back of the driver. The top extremity of this shaft engages the rocker arm when the machine cycles. This action forces the shaft downward to spread two spring-tensioned prongs.

Through a pivotal point, force is transmitted to partially close the forward portion of the prongs (similar to a pair of tongs) and clinch the ground terminal to the fiber board base. The plunger retracts and the springs return the prongs to their initial position.

Concurrent with this operation, the two drivers on the riveting machine descend to set the two semi-tubular rivets that fasten the terminals for power leads and the track Lockon clamps to the fiber

board base. This is one of the few double-spindle machines used at Lionel.

Machines for setting tubular and semi-tubular rivets come in many types, models and sizes, including bench-mounted, floor mounted, manual, electric, pneumatic, hydraulic, single-spindle, multiple-spindle with fixed or adjustable center distances, multiple heads, etc.

ADOPT ONE MACHINE AS BASIC RIVETER

Because of the relatively small size of their products and the use of rivets to assemble most of them, Lionel makes extensive use of bench-mounted electric-driven machines. Normally, they prefer single spindle machines. They have found distinct advantages in the flexibility and low maintenance associated with this basic riveting tool. In one department, they have had 15 such machines running five days a week for five years without a major breakdown.

Also, they found that an operator has less difficulty in orienting parts, that tooling and positioning fixtures are less costly, and that production rates can be maintained at acceptable levels despite the fact that only one rivet is set on each machine cycle. Rates of over 800 pieces per hour are not considered unusual at Lionel for the "basic" single-spindle machines.

Although model trains are becoming more popular as an adult hobby, and although there is a novel but still limited practice of using these toy trains to handle materials, the electric train business is still highly seasonal. Rather than turn extensively to sub-contractors, Lionel estimates its total requirements and spreads the work out over longer periods, then uses additional machines to help handle peak demands. This is where the relatively low cost of riveting machines pays off.

To reduce the number of items in inventory and hence cut handling, storage, and purchasing costs, Lionel is endeavoring to standardize its fasteners. Significant progress has already been made. Rivet finishes are confined to nickel; the number of rivet sizes has been diminished; steel supplemented by a limited quantity of brass rivets are generally specified, and head configuration is predominantly oval.

Nevertheless, design and production personnel do not hesitate to specify a special rivet if there is an obvious design or production advantage in doing so. For example, a complex steel stamping has been replaced by a new coupling mechanism of simplified design. It has a single strip of spring steel ¼-inch wide by 1⅜-inches long, pierced at one end for a 3/64-inch diameter, nickel-silver, flat head rivet. This flexible part is then riveted to the underside of the coupler bridge. The flat head

continued

In-line riveting operations assemble the coupler and wheel carriage for a miniature electric train. Semi-tubular rivets formed with oversized heads are used to retain a component of the coupler engaging mechanism in a flat position.

Re-tooling this standard single-spindle machine allows the rivet to be fastened to a spring clip without setting it. Metal in the rivet shank is swedged against the clip and the rivet becomes an engaging pin.

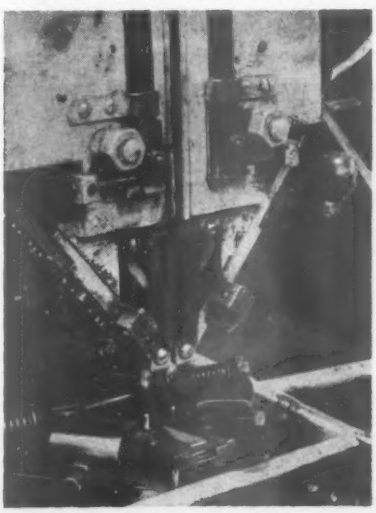
rivet serves as an engaging pin for the coupler. Therefore, the spring steel strip must be held perfectly flat against the coupler in order to function properly. A semi-tubular rivet with an oversized head set in an automatic riveting machine does the job. This is a good example of rivet performing two functions—as a contact and as a fastener.

UTILIZING DIFFERENT CLINCHES

The techniques for fastening the front truck and bracket together for a Lionel locomotive are a bit different. Rivets are set in a press, with all parts including the rivets fed by hand. For functional reasons the truck must be free to turn. It also must be under tension to insure a good electrical ground connection with the track rails. To impart these characteristics into the design, a steel oval head semi-tubular rivet and a coil spring are combined in the assembly.

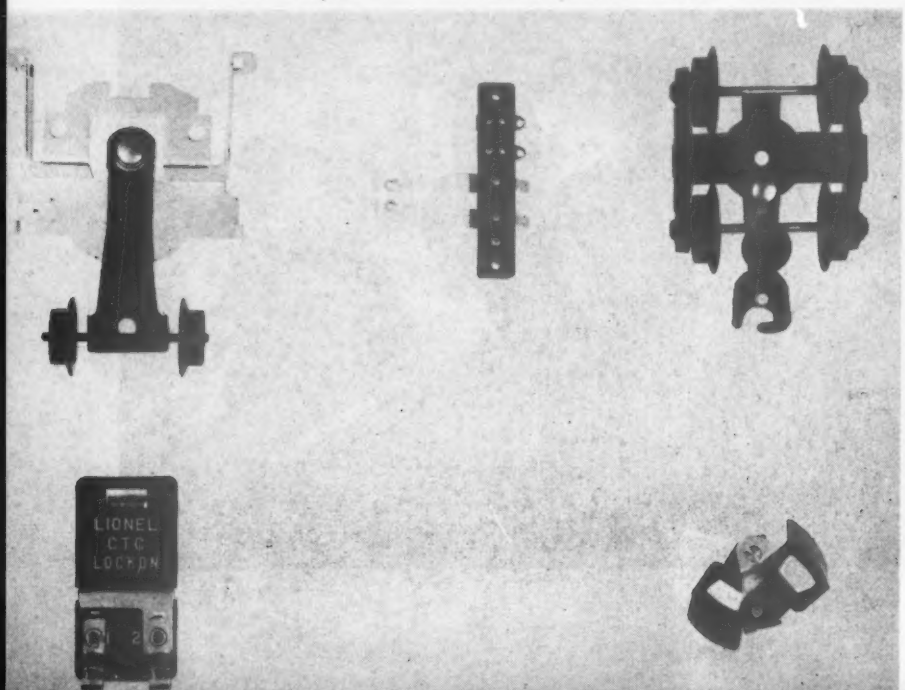
The operator locates the stamped bracket over a guide pin in the rivet anvil, overlaps it with the tongue on the truck, lays the spring on top, and actuates the press. The anvil post, in which a star-set anvil is mounted, is adjusted in height to set rivets away from the work; the truck can

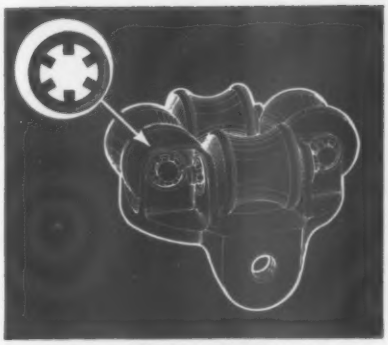
continued



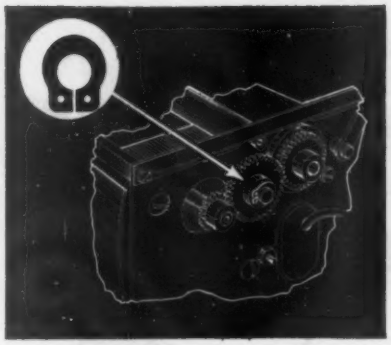
Spring-tensioned prongs have been added to this double-spindle machine. Actuated through a vertical shaft connected to the drive mechanism, it clinches a ground terminal to the fiber base. Concurrently, two semi-tubular rivets that hold the power terminals to the base are set.

Typical assembled parts are: Upper left—A truck is fastened with one rivet backed with a coil spring; Upper center—Brass rivets fasten a plastic base with circuitry leads; Upper right—Two rivets (fastener and engaging pin) operate a coupler mechanism. The larger rivet has an oversize head to retain a piece of spring steel flat against the plastic tongue. Lower left—A fiber base, two terminals and a ground plate comprise the Lockon piece that is the power takeoff connection to train trackage; Lower right—Rivets must be set to allow the end pieces on a locomotive part to swivel.

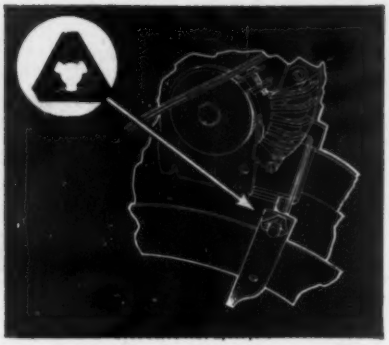




Drilling and flaring eliminated. Easier maintenance, a time saving of 50% and elimination of costly, time consuming drilling and flaring operations result when Truarc Series 5115 self-locking rings are used to retain rollers on pins in this electric cable guide. Extra long prongs enable ring to accommodate wide shaft tolerances.

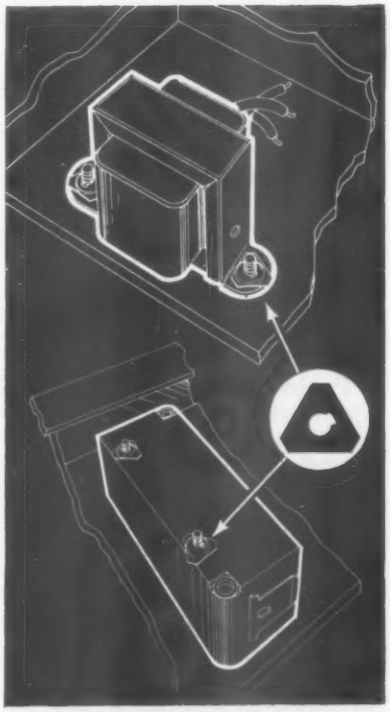


Economical fastening for idler gear. Installing Truarc Series 5555 Grip Ring flush with hub insures precise seating of gear in this portable electrocardiograph assembly. What's more, the ring eliminates a nut and costly stud-threading operation of alternate design. **Typical savings amount to $365 per 1000 units.**



Cross-drilling and cotter pin eliminated. Here a Truarc Series 5305 self-locking triangular retainer replaces a cotter pin used to hold an electric-motor mounting bar. Both the cotter pin and the cross-drilling operation required in the original design are eliminated. **Typical total savings amount to $120 per 1000 units.**

Truarc self-locking retaining rings boost economy in wide variety of designs



Easy way to mount electrical-electronic parts. Truarc Series 5300 triangular nuts replace conventional nuts and lockwashers in mounting electrical parts like transformer (top) or Microswitch (bottom). Dished body of Series 5300 flattens under torque, eliminates need for lockwasher, simplifies handling and assures assembly.

...eliminate parts, machining, speed assembly

Easy application, elimination of more expensive conventional fasteners and reduction or elimination of machining operations are just a few of the savings resulting from the proper use of self-locking retaining rings. Rings replace threaded retainers and nuts, hairpin-type cotter pins, and a variety of cut, lock, and plain washers. They require no groove, or preparatory machining operations. Rings can be installed by unskilled labor, seated at any point on the shaft, automatically taking up any accumulated tolerances.

Four ring types are shown. One has a dished triangular body which locks the fastener on the shaft under spring tension, holds under moderate shaft tolerances and against extremely heavy thrust loads. Another, a re-usable Grip Ring, is ideal for ungrooved shafts, tubes, bosses, and studs. A third type is a triangular free-spinning nut with a dished body that flattens under torque, eliminating need for separate lock washers. The fourth, a push-on type, has an arched rim to provide high strength and extra long locking prongs which accommodate wide shaft tolerances.

These are but four of the 50 functionally different types of Truarc retaining rings. They come in 740 standard sizes, 6 metal specifications, 13 different finishes. The entire Truarc line, including assembly tools, grooving tools, and 80 typical cost-saving applications, is covered in the new catalog RR 10-58. And remember, Waldes engineers are always ready to help you solve your application problems—whether they involve one of the standard Truarc rings or a "special" to fit your particular requirements. Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N. Y. 9.15

WALDES
TRUARC®
RETAINING RINGS
Waldes Kohinoor, Inc., Long Island City 1, N. Y.

TRUARC RETAINING RINGS . . . THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS

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ALLEN

The cost of ALLEN Hex-Socket Cap Screws is only a minor fraction of your assembly costs . . . be sure you're getting the timesaving, cost-saving advantages of genuine Allens!

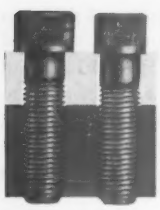
Ever since Allen first produced the hex socket head screw nearly fifty years ago, specifying *genuine* Allens (made by Allen of Hartford) has been a sure way to guarantee dependable threaded fastening.

Only *genuine* Allens have Leader Points that make starting easier, and greatly minimize danger of cross threading. *Genuine* Allens are "pressur-formd" to preserve the long fibers uncut throughout the length of the screw, giving stronger sockets for greater tightening torque.

Write for samples and engineering data. See how *genuine* Allens will make your product better.

ALLEN HEAD
HEX-SOCKET SCREWS

Allen's new 1960 Series Socket Head Cap Screws give up to 2½ times more load carrying capacity, without indentation.



Head diameter of sizes from ¼" up is now uniformly 1½ times the body diameter—providing more under-the-head bearing surface, and a proportionate increase in clamping force. Write for new Bulletin G-25, with full specifications.

Stocked and sold by leading Industrial Distributors everywhere

ALLEN
MANUFACTURING COMPANY
Hartford 1, Connecticut

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pivot around it while the spring is compressed sufficiently to provide tension to hold the truck against the track.

Two different types of fasteners —one a semi-tubular rivet, the other a screw—hold the base of the train car to the running gear carriage and the boxcar superstructure to the base. Both parts are assembled at the same station by the same operation with a minimum of handling.

The running gear carriages are riveted to the base of the car in a pedestal-mounted single-spindle machine fed by a rotary hopper. Again, the anvil post adjustment determines the freedom of the running gear to swivel around the rivet.

Once the gear is attached, the operator places the partial assembly on an adjacent inclined jig, fits the superstructure over two projecting hinges at one end. An automatic screwdriver tightens two screws to complete the assembly.

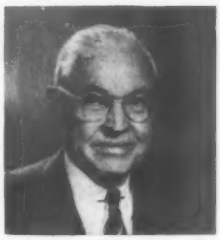
Obviously, there are many other important aspects to Lionel's assembly operations. The manner of supplying parts to various stations . . . the use of conveyors to transport sub-assemblies to temporary storage or main assembly lines . . . and the method of machine arrangement are but a few approaches that have also aided in reducing assembly time.

Production engineers point out that rivets and automatic setting machines are only a part of the overall assembly program. They emphasize two other important factors—the necessity for the design staff to integrate rivets throughout their fastening applications and the advantages of having production men review designs before they are finalized in order to make maximum use of fastening equipment now in the plant.

The salient point is this: While there is no assurance that planned assembly will lead to efficient assembly, the odds are certainly in that direction. And if Lionel's experience is any guide, the results that can be achieved are worthy of the effort. •

RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technical-ities

By John S. Davey

The choice between a cap screw and socket head screw

If you have the choice, make it a socket screw when you have a space problem, but choose the cap screw for more holding power per dollar.

No question that you should apply socket screws in counterbored holes; and that you can clear tight spaces. What you can't do is utilize the full strength of the alloy needed for the socket head. And remember, strength of a connection depends on how you preload the fasteners, and not on the strength of the fastener material alone.

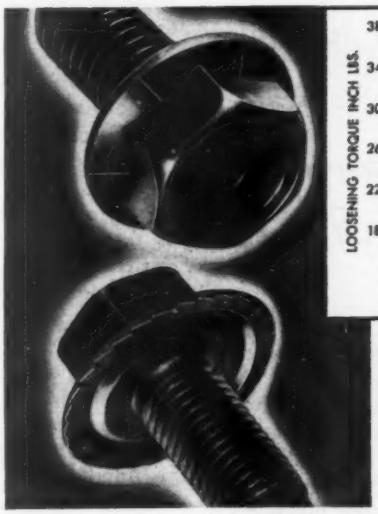
THE HANDICAPS OF ONE

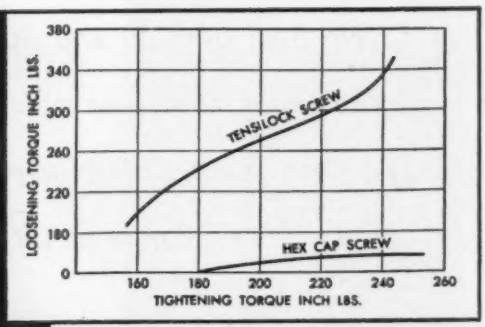
Internal wrenching rarely develops as much torque as needed for proper preloading. And if high torque is developed, the smaller bearing area of the socket head tends to crush the surface on which it bears rather than increase tension or preload.

THE ADVANTAGES OF THE OTHER

If you design to take advantage of heat treated cap screws of SAE grade 5 quality, you'll get a stronger connection at lower cost. These standard fasteners have ample bearing and wrenching surfaces, can be torqued right up to yield strength. They also cost less than the alloy fasteners.

New TENSILOCK* Screws seat tighter, lock tighter





Graph shows example of on-torque and off-torque relationship. It takes more torque to loosen than to tighten.

RB&W's new TENSILOCK screws, the toothed fasteners with high tensile locking, are identified by six radial dashes on flange.

Head has integral washer face with teeth that lock fastener to surface. Circular groove allows flange to flex and seat to bear solidly on surface.

RB&W's TENSILOCK fasteners feature ratchet-like teeth formed at an angle which cuts driving effort yet which enables the teeth to bite in firmly and give an improved grip against back-off.

In addition, a circular groove in the integral "washer" permits the flange to flex upon tightening, and helps maintain tension in the fastener and pressure on the teeth.

IMPROVED TENSION TO TORQUE RATIO

With reduced friction under the head, the new tooth design has enabled more of the wrenching torque to be used to develop tension and less to overcome friction. Since the flange flexes, it allows the screw to bear solidly on its seat. All of the high strength capabilities of these heat-treated one-piece fasteners can now be attained for a stronger assembly.

MORE LOCKING POWER

Tensilock screws need up to 40% more off-torque than on-torque. Combining this feature with the higher residual tension, and the diaphragm action of the integral washer face, these fasteners give superior locking and holding power for permanently tight, strong joints . . . even under severe vibration and cyclic temperature changes.

Now available in limited range of screw types (not in flat head), and in various nut sizes. For details, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York. *Trade Mark Pat. applied for.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa., Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

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PRECISION WORK REQUIRED IN

Assembly and inspection work at Circle Seal overlap and dovetail to the point that assemblers are charged with maintaining inspection vigilance at all times

What goes into the making of a precision, leak-proof and fail-proof industrial valve?

This question might stump engineers who have employed such valves for years. Many of these valves work silently, inconspicuously, and without attention. Yet failure or leakage at any time could cause instantaneous and costly, if not tragic disaster. A check valve which allowed back flow and mixture of inflammable or explosive gases or liquids, or a faulty relief valve which allowed excessive pressure build-up, are typical examples.

A trip through the shops of Circle Seal Products Co., Inc., Pasadena, California, one of the nation's major precision valve manufacturers, would reveal just how the leak-proof and fail-proof qualities are incorporated in these valves. The production elements are the same as for any product—design, component manufacture, assembly, inspection, and testing. But at Circle Seal, it is a complete and comprehensive coordination and integration of these elements which produce the desired, and sometimes almost unbelievable results. Trying to establish a line of demarcation between these production elements would be like trying to segregate the hole from a doughnut.

Precision valves produced at Circle Seal include the check, relief, shuttle, gauge protection, manifold shutoff, three-way, and plug varieties. Many valve orders are for custom variations on standard company designs. These types preclude mass-production on these orders. But regardless of its ultimate use, or custom variations imposed on the design, each and every valve which leaves the shop must meet the same rigid requirements and specifications. A simple shutoff valve intended for use in a low pressure, non-dangerous hydraulic system is put together and tested just as carefully as an automatic check or relief valve which controls and acts as a guardian in systems which could become extremely dangerous in the event of valve leakage or failure.

According to a company quality control engineer, this serves a double purpose. "It assures consistent high quality in all Circle Seal valves, while at the same time it prevents a carry over of non-vigilance on the part of shop personnel from non-critical into critical production."

It is not the intent of this article to detail step-by-step how precision valves are designed, produced, and tested. Rather, an attempt will be made to detail specific operations and test procedures which can be adapted for product improvement in other industries producing hydraulic or pneumatic equipment, or where hydraulic or pneumatic components play an important role in product design.

Valve component manufacture at Circle Seal follows very closely the routines employed in most precision shops. All incoming raw material is thoroughly inspected, coded for future identification, and must bear the appropriate stamps and be accompanied by vendor certifications when required. This material is issued to the shop in the exact type, sizes and amount specified on a production order and in "job unit form" along with the blueprints, tooling, and setup instructions for the job to be performed. First article inspection is required on every production run, or after a setup or tooling change has been made.

CONSTANT IN-PROCESS INSPECTION

Constant in-process floor inspections, and a requirement for the operator to maintain constant inspection vigilance, coupled with sample inspection of finished lots, assures delivery of consistently high quality parts to the assembly store room.

It is after component part manufacture that the unusually close cooperation between assembly, inspection, and testing takes place. These three activities actually overlap and dovetail in so many places it is sometimes difficult to state whether a specific

by **William D. Engstrand,** West Coast Editor

VALVE ASSEMBLY

person should be classified as an assembler or an inspector.

All assemblers are charged with maintaining inspection vigilance at all times. Any slight deviation in uniformity, cleanliness standards, fits, etc., must be reported to a leadman or supervisor immediately so that corrective measures can be taken. This, of course, is supplemented by constant floor inspection while assembly is in progress.

On all but the largest production orders, an assembler starts and finishes the assembly of each valve, instead of the valves passing from one assembly station to the next. It has been determined at Circle Seal that such follow through is far more conducive to consistently high quality assembly work. But this does not mean that certain phases of the assembly work are not "farmed out" to specialists. Press fits, and the installation and contouring of "O" rings on valve poppets fall in this category.

Numerous Teflon "O" rings are used in Circle Seal valves because of this material's resistance to corrosion, wear, deformation, and chemical attack. When these rings are required, the poppet and seat portion of the valve is routed to a special bench. The operator at this station then withdraws the necessary rings from the stockroom.

MICROSCOPIC INSPECTION OF RINGS

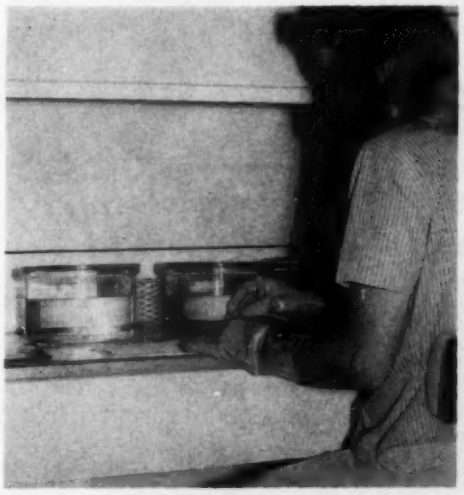
Even though these "O" rings are microscopically inspected when they enter Receiving Inspection, the operator inspects them again just before installation, looking for cracks, scratches, or dirt specks which might interfere with the ring's sealing properties. He then dry laps the i.d. of the ring to produce small concentric "flats" along each side which will match exactly the included angle between the valve poppet and the valve seat. This is accomplished on a small engine lathe.

Some of the "O" rings then need o.d. contouring so that they will fit more snugly into the i.d. contours of the valve assembly when the valve is in the closed position. This is accomplished on a small grinding wheel with a centralized hole in it. The rim on this hole is concave contoured to the exact dimensions of the contour radius required on the o.d. of the ring. The metal backing plate on the very thin grinding wheel contains a pilot hole centrally

continued

All threaded valve components are carefully torqued during assembly.

Orifices are capped after final testing to keep dirt and other material out of valves.



Liquid oxygen valves are assembled in an air conditioned room, and under a vented hood, to assure freedom from contaminates.

located just behind the hole in the grinding wheel. This hole is sized to fit the stem of the poppet on which the ring will be ground, and assures concentricity of the radius grind on the ring o.d.

In grinding, the operator first installs the "O" ring on its poppet (after the i.d. flats have been lapped), then inserts the poppet stem in the pilot hole behind the thin grinding wheel. The poppet is then pushed inward until the ring contacts the contoured rim of the hole in the grinding wheel. This setup and its use is far more simple than the wordage required to describe it, as can be seen in the accompanying photo.

Both lapping and grinding on the Teflon "O" ring result in a 15 micro-inch surface finish. This fine finish, in conjunction with the greater contact areas provided by the i.d. "flats" and the o.d. contours when the valve is closed are largely responsible for the leak-proof feature inherent of Circle Seal valves. To further enhance this feature, the ring on the poppet "floats free" when the valve is open, thus allowing normal valve flow to wash it free of any dirt which may have been carried in through the system. On high pressure valves, where the dynamics of the flow rate might cause the ring to extrude slightly and deform while floating in this free position on the poppet stem, the poppet spring cage is designed to restrict any stretching of the ring while in the free position. This prevents any deformation.

Normally, after the "O" rings have been lapped, installed on the poppet, then radius ground, the poppet and valve seat assembly is returned to the original assembler who completes assembly of the valve.

Two types of threads are used on Circle Seal metallic valve components. Class 3 unified threads are used on all parts which will be assembled as they come from the machine shop; Class 2 unified threads are used on all components which will be plated prior to assembly. The greater tolerance of the Class 2 threads provides room for plating build up. All threaded parts are eventually assembled at specified torques. In some cases a calibrated torque wrench is used. When a power tool is used, the tool is carefully adjusted to deliver the right torque at its maximum power.

A DUST-FREE ASSEMBLY BOOTH

Another feature of the Circle Seal assembly line is the dust-free booth in which certain valves are assembled. Many of the valves assembled in this booth are used in liquid oxygen systems where even a microscopic trace of a hydrocarbon contaminate might cause fire. This is essentially two booths in one, with the room itself approximately 7-ft. square. It contains an assembly table with a transparent pull-down plastic hood.

All air entering the room is filtered. A slight positive pressure is maintained so that there is always an outward flow of air when the door is opened. Air under the hood on the assembly table is furnished by two filters which are 99.5% efficient at .02 microns. Air pressure under the hood is again positive so that the flow is always outward. All valve components to be assembled in this room are first trichlorethylene degreased. Just prior to assembly, each component is "blown off" with bottled dry nitrogen which conforms to a Mil. Spec. After the valve has been assembled, and while still under the hood over the assembly bench, it is inserted and sealed in a polyethylene sleeve.

Valve testing at Circle Seal Products is an interim operation in conjunction with valve assembly because, after testing, the valves are returned to as-

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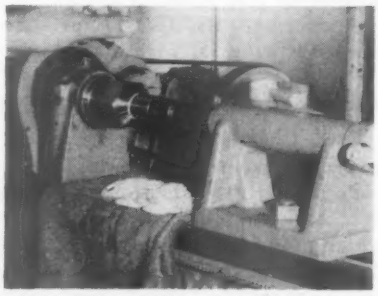
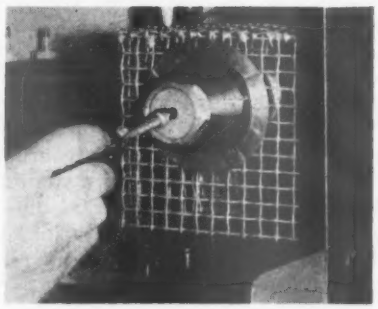
In one of many tests, completed Circle Seal valves must hold 1-in. column in U-tube for from 2 to 3 minutes despite nearly 0 pressure which actuated valve closing.



Dry lapping the i.d. of a Teflon O-ring to produce small concentric flats, using small engine lathe.



Contouring the o.d. of a similar ring to fit i.d. contours of valve seat assembly.

Bodine CASE HISTORY NO. 42

HEADLIGHT ADJUSTING SCREW ASSEMBLY SPOTLIGHTS VERSATILITY OF BODINE METHODS

This is but one of many ways in which versatile, time-tested Bodine basic machines and units can be teamed to create high-speed, cost-cutting assembly units without resort to costly "specials."

Note especially the ease and convenience with which auxiliary equipment (in this case automatic hopper feeds) can be grouped around the Bodine "chassis." Note also the high production and close limits maintained on this day-in, day-out production line job for one of the world's largest automobile manufacturers.

PRODUCTION: 3,000 completed assemblies per 50-minute hour. Machine speed, 30 strokes per minute.

1

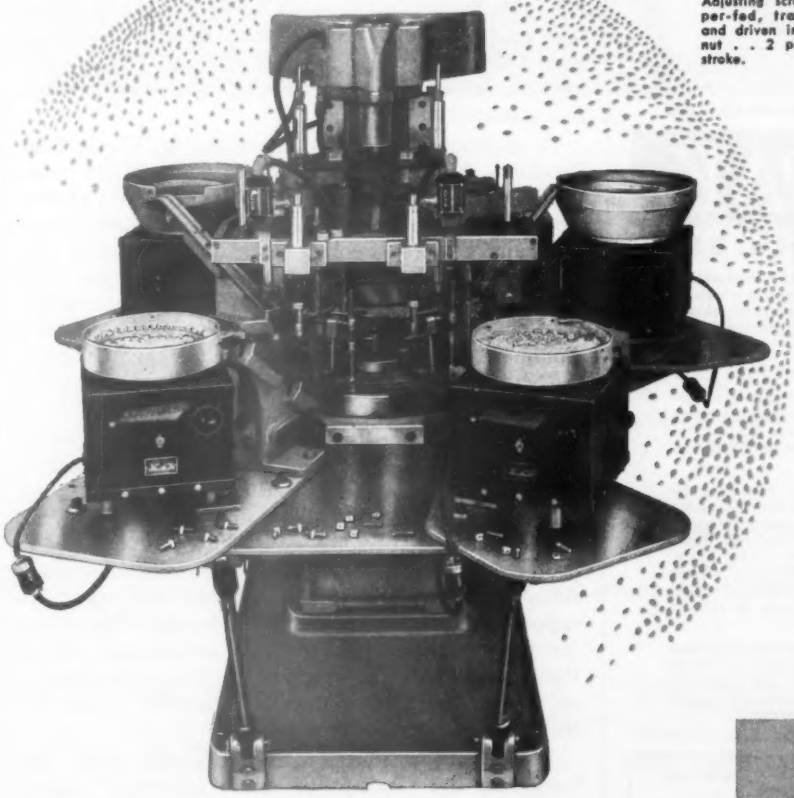
Unthreaded molded nylon nut hopper-fed and transferred to the dial fixture . . . 2 pieces per stroke.

2

Adjusting screws hopper-fed, transferred and driven into nylon nut . . 2 pieces per stroke.

3

Auto eject completed assembly. Depth of screw driving held consistently within ½ turn in untapped nut.



Write Dept. AF-11

If high-speed, low-cost assembly is one of your problems . . . in metals, plastics, or a combination of both . . . with or without concurrent machine operations . . . check first with Bodine. The possibilities of our methods are practically unlimited.

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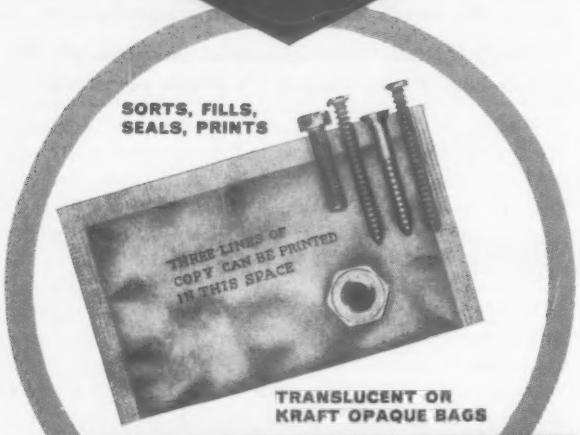
(manufacturers of fasteners)



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Here is a new concept in packaging of assembly materials. fasten-PAK electronic packaging is less expensive than any other method now employed and when your materials are purchased from Mid-Continent Screw Products Company, your savings are doubled.

Here is what **fasten-PAK** does for you!

1. **fasten-PAK** will sort assembly materials in a multiple of sizes and assortment. It will package items in either translucent or kraft opaque bags completely enclosed. The package is printed, filled, and sealed in one operation.

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3. Each package may carry your own message, printed on the bag. Up to three lines of copy may be used to describe the contents and promote the quality of your product. This feature also eliminates any chance of error in packaging of proper materials.

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Producing Precision Valves, continued

sembly for closure and sealing. The final inspection and testing rooms are closed off from the assembly area and provided with filtered air. All valves are 100 per cent inspected and tested for such critical characteristics as cracking pressure, zero leakage, and proof loads.

Here again dry nitrogen conforming to a Mil Spec. is used for loading the valves during test, and all test fixtures have a 2 to 10 micron filter mounted just as close as possible to the valve being tested. The combination of the two effectively prevents valve contamination during testing.

Mercury manometers are used for checking pressures from 0 to 15 pounds; certified gauges for pressures from 0 to 200 pounds. A hydraulic test bench is available which will provide from 0 to 300 psi, and flow rates ranging from .05 to 45 gallons per minute. A pneumatic test bench and water tank are used to test leakage and proof load high pressure valves.

Many Circle Seal valves have cracking pressures which approach the zero point. Yet such valves must be absolutely leak proof when closed at minimum pressure. When testing these valves for leakage, they are mounted in a test fixture and loaded with just enough air to raise a column of water one inch in a small "U" tube. The valves must hold this water column level for from 2 to 3 minutes to pass the test despite the nearly zero pressure load which has actuated the closing.

To supplement production testing, the Circle Seal Products Engineering Laboratory conducts continuous life cycle tests on valves selected at random from the assembly line. These tests include automatically counted cycling tests under normal, elevated, and sub-zero temperature conditions. The latter two tests are in excess of any conditions anticipated during normal service life. Salt spray chamber tests, and other corrosion tests which check the valve's resistance to specific mediums, are continuously under way.

After production testing, the valves return to an assembly station for a final visual inspection, oiling and closing. The amounts and types of deterioration preventives applied to the valve depend upon its subsequent use. In some cases only the "O" ring is protected; in others the entire valve may be coated. After this oiling, all open ports on the valve are capped with a plastic or metal closure. The valves are then ready for the shipping department where they are individually wrapped in either waxed paper or polyethylene film, then individually boxed for shipment.

This is the production and assembly cycle that backs up the "leak-proof" and "fail-proof" claims made by Circle Seal Products Co., Inc., for their valves. And a single example will illustrate the validity of such claims for valves produced under the exacting conditions outlined in this article.

One customer ordered 172 highly critical valves, then subjected each one to rigid engineering tests in their own engineering laboratory. Of the lot, not a single valve was rejected.! ●

CUT UNIT ASSEMBLY COSTS . . GET HIGH-SPEED LOW-COST FASTENING . . TAKE ADVANTAGE OF AUTOMATIC ASSEMBLY

Milford shows you how to cut assembly costs!

Tubular rivets are basically a low-cost fastener. Feed and clinch them with automatic Milford Riveters, and you *multiply* the cost savings inherent in rivets.

The Milford Riveter shown here is only one of a full line of automatic machines. Bench or floor models . . . single or multiple spindle . . . manual or automatic, the Milford Riveter line is designed to solve your toughest assembly problems.

Remember . . . these are *basic* rivet-setting machines. They can be tooled quickly and inexpensively for your particular assembly needs. And it's up to you whether you buy or lease.

For a complete line of fasteners . . . for fast, trouble-free assembly—look to Milford first!

MODEL 220-BH

MODEL 220-BH

RIVET CAPACITY: 3/32" dia. by 1/8" length to 9/64" dia. by 3/16" length.

THROAT DEPTH: 11"

POST HEIGHT: From 0" to 18"

HOPPER: Rotary

CLUTCH: Single trip, non-repeating Horton type

FLYWHEEL: 260 R.P.M.

DRIVE: V-belt noiseless

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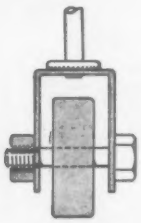
THE LIQUID LOCK FOR METAL PARTS

. . . improves fastener reliability and reduces costs!

LOCTITE sealant makes ordinary fasteners into lock fasteners at savings of 40%-70%. Locking action extends over the entire engaged area providing unequalled resistance to vibration . . . ends breakdowns due to loosening of fasteners. A single drop of LOCTITE replaces all sizes of lock nuts, lock washers, lock screws, jam nuts, staking and interference threads.

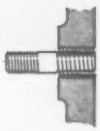
– ELIMINATES LOCK WASHER OR SELF-LOCKING SCREW

Makes ordinary screws into lock screws. Several times the holding power at savings of $20/M.



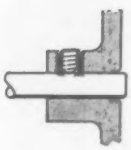
– ELIMINATES SELF-LOCKING NUT OR JAM NUT

Locks non-seated nuts anywhere along the length of thread.



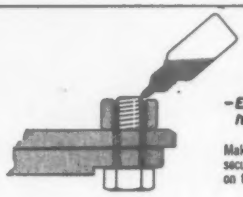
– ELIMINATES INTERFERENCE FIT

Locks studs securely . . . locking action develops after stud is in place . . . allows easy-driving Class 2 threads. End stripped threads, broken studs, damaged castings.



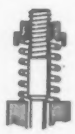
– ELIMINATES DOUBLE SET SCREWS, SELF-LOCKING SET SCREWS, JAM NUTS ON EXTENDED SET SCREWS OR STAKING

LOCTITE-treated set screws cannot vibrate loose . . . end nuisance service calls.



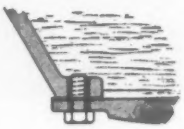
– ELIMINATES SELF-LOCKING NUT OR LOCK WASHER

Makes any nut a lock nut. Saves 40%-70%. Holds securely where lockwashers fail. Does not depend on tightening torque for locking action.



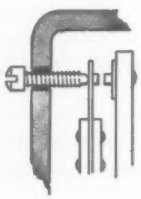
– ELIMINATES SPECIALS OR STAKING

Makes any threaded part self-locking.



– ELIMINATES BLIND HOLE TAPPING, SPECIAL LEAK-PROOF FASTENERS

LOCTITE locks and seals threaded parts against vibration and high-pressure fluids.



– ELIMINATES SELF-LOCKING SCREW OR JAM NUT

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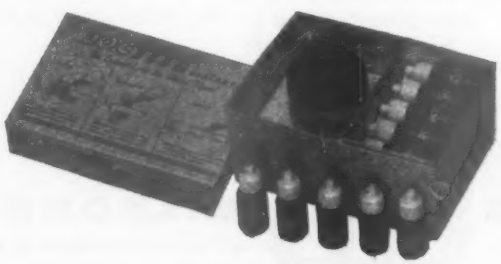

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A discussion of the present state of these joining techniques plus a look into the trend of new developments

SHEAR STRENGTH OF BRAZED AND SOLDERED JOINTS

by **Karl M. Weigert,** Ph.D.
Senior Research Metallurgist
Research Division
Curtiss-Wright Corporation
Quehanna, Pennsylvania

Brazing and soldering are very old processes. However, it was not until recently that the understanding of the mechanism of these joining processes has been investigated from the point of view of the metallurgist. It is the purpose of this article to describe the present state of the art and to discuss differences in joining techniques and the trend of future developments.

Prior to 1930 only a few metal joining processes existed in which filler metals were used, e.g. certain low melting so-called "hard" and "soft" solders consisting of eutectic mixtures of metals like silver-copper and tin-lead. The use of "spelter," or 50/50 brass as we would call it today, was also common. Lead, tin and zinc base solders were quite inexpensive but produced relatively weak joints of only about 1000 psi shear or tensile strength. The silver-copper eutectic, at 72% silver, was for most applications, except for the jeweler and dental trade, considered too expensive and the higher shear and tensile strength of about 30,000 psi was not enough to justify the expense. Spelter was quite competitive in price although its flow point was over 1600°F; its joint shear and tensile strength went as high as 30 to 40,000 psi.

In the early AWS-ASTM specifications, which are still in use today and recognized in some but not all technical circles, the term (soft) soldering was used for filler metal joining processes below 800° F; all other filler metal joining processes were automatically marked as "brazing." In this classification where one significant temperature separated all filler metals, difficulties were unavoidable.

According to the phase rule only pure metals and so-called eutectic mixtures have one significant temperature at which the solid liquid transformation occurs, e.g. 631°F for the 38% lead-62% tin and 1435°F for the 28% copper-72% silver eutectic composition. Most commonly used solders and brazing alloys melt over a range of temperature rather than at a definite melting point.

By definition, the melting or solidus (temperature) point was said to be the temperature below which all phases of the filler metal were solid, and the fusing or liquidus point above which the whole filler alloy became liquid. The determination of the melting or solidus point was relatively simple: by puddling around in the molten metal or more accurately by the interpretation of cooling curves.

It was agreed by practical experience that a temperature slightly above the melting point was sufficient to flow the filler metal into a joint and form a good bond. This temperature was called the flow point in this country and the working temperature in Europe. As long as the solidus-liquidus melting range was only as small as 20 to 30°F, the flow point was identified with the liquidus temperature. Discriminating between the three temperatures became an academic question.

With the introduction of certain copper base filler metals (Cu 85, Ag 15, P5) and nickel base brazing alloys (Ni 80 Cr 15, B 5 and Ni 75 Cr 15 Si 10 approximately), solidus and liquidus temperatures were more than 200°F apart. It became undesirable to heat the filler metal up to the liquidus temperature. Firstly, the filler metal would have spread too far due to segregation of high and low melting constituents, known as "too runny." Secondly, the filler metal could react too much with the parent metals forming undesirable brittle compounds in the interface and severing the parent metal by intergranular erosion leading to stress corrosion.

It became customary not to

continued

refer to the true liquidus temperature as most of them have never been determined or published accurately for fear a competitor might "claim" a lower liquidus temperature composition. It has been shown by research that more than one solid phase forms in cooling the filler metal at distinctly and reproducibly determined temperatures. The significant flow point would be a temperature where from two solid phases only the lower melting one is entirely liquefied. It has been found from experience that the lower melting phases form brittle joints, especially if they completely surround the more ductile primary dendritic phases. It takes expert interpretation of photomicrographs to distinguish between remelted and unmelted constituents. For the correct evaluation of cooling curves the melts have to be heated considerably above the liquidus temperature and a cooling rate has to be maintained where the small liquidus and intermediate transformations would register.

In the 1930's, new silver base alloys were developed with only 45-50% silver with flow point temperatures of 1150 to 1180°F. These alloys had joint shear strength up to 40,000 psi and tensile strength over 100,000 psi, sometimes exceeding the strength of the parent metals. These silver base alloys, called silver solders, replaced the spelter filler metals rapidly.

Demands for a filler metal that works around 1000°F and would contain smaller amounts of silver have been heard from the public through all these years. However, metallurgical phase diagram studies can show the futility of this request. The formation of semi-metallic gamma and delta phases renders the filler metal hopelessly brittle. On the other hand, there is a good chance to increase the strength of zinc base and other white metal base alloys retaining by some additions sufficient ductility to produce joints of 20,000 psi in shear and tension with high creep strength.

The development of high temperature super alloys created a demand for joining processes of metals at higher and higher temperatures. The words shear and tensile strength became meaningless and were replaced by creep resistance under tension or shear loading. Examples are the nickel-chromium base brazing alloys containing borides and silicides with melting ranges around 2000°F. Strangely enough their mechanical high temperature properties are remarkably good. It is the danger of room temperature loading that limits their reliability.

British developments of precious metal high melting alloys (Ag-Mn-Pd) claim to have overcome this difficulty. The demand for joints between tungsten, molybdenum, tantalum, and other refractory metals that would withstand more than 3000°F led to the development of compounds like molybdenum-boride (melting point

continued

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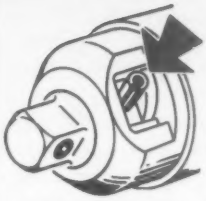
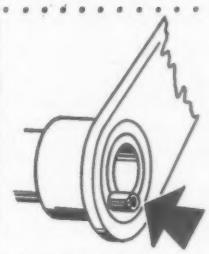
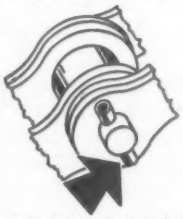


REPLACING A GROOVED PIN . . . in this application, Rollpin serves as a stop pin in a ratchet wrench adaptor. With its light weight and high shear strength, Rollpin functions perfectly . . . cuts assembly costs.



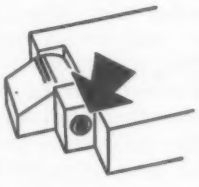
REPLACING A KEY . . . Rollpin demonstrates its ability to do away with precision tolerances, in this heating system damper arm. Faster, cheaper and more satisfactory than previous assemblies.

REPLACING A RIVET SHAFT . . . Rollpin serves as an axle for the sparkwheel of a cigarette lighter. No riveting or threading necessary . . . faster assembly. Note flush, clean fit.

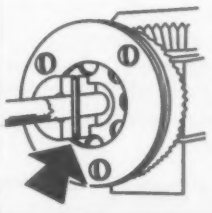


REPLACING A COTTER PIN . . . Rollpin assembly time is shorter, service life ten times longer. Vibration-proof flush fit. Easily removable.

REPLACING A SET SCREW . . . to fasten automobile brake handle a short length Rollpin is self-retained in the hand grip but can easily be driven into over-drilled hole in shaft for simple handle removal.

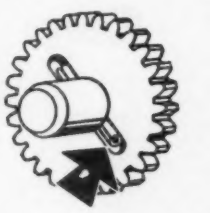


REPLACING A CLEVIS PIN . . . here Rollpin holds firmly in clevis, permits free action of moving member. Rollpin application shown is the plate of a home workshop tool.

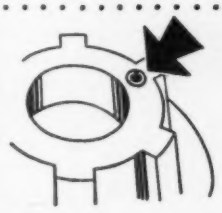


REPLACING TAPER PINS . . . in the assembly of precision differentials eliminated cost of taper pin reamers and the entire reaming operation. Rollpin costs less than a taper pin and installation is cheaper. They remove easily.

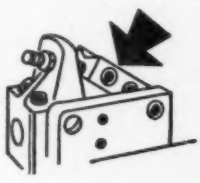
REPLACING A HEADED PIN . . . in this hinge pin application, Rollpin is simply and inexpensively driven in place, greatly reducing assembly costs. Constant spring tension holds Rollpin firmly in place . . . eliminates loosening of hinge due to wear.



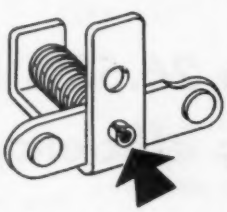
REPLACING A HUB ON A GEAR . . . Rollpin, self-retained in shaft, is simply snapped into molded slot to position sintered gear. This application, by an office equipment manufacturer, effects major savings in assembly. Rollpin's high shear strength is particularly valuable here.



REPLACING A DOWEL PIN . . . Rollpin is used here to prevent rotation of a thrust bearing. No reaming, no special locking. Easily removed. Lowest possible dowel pin cost.



REPLACING A BOLT AND NUT . . . Rollpins act as fasteners and pivots for the linkages in this electric welder. Rollpins may be used with a free fit in outer or inner members depending upon product design requirements.



REPLACING A RIVET . . . Rollpin serves as guide shaft for spring-loaded electrical interlock contacts. This electrical equipment manufacturer reports that rivet failure previously occurred at the clinched end under normal operating impact and vibration.

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Rollpin is the slotted tubular steel pin with chamfered ends that is cutting production and maintenance costs in every class of industry.

Drives easily into standard holes, compressing as driven. Spring action locks it in place—regardless of impact loading, stress reversals or severe vibration. Rollpin is readily removable and can be re-used in the same hole. Made in carbon steel, stainless steel and beryllium copper. Write for samples and information, ELASTIC STOP NUT CORPORATION OF AMERICA, 2330 Vauxhall Road, Dept. R47-1197, Union, New Jersey.

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It takes 12% to 23% more torque to release a Mac-it IB screw. That means it holds tighter. Indenting and corner fatigue are eliminated. And the new IB is self-aligning, tight-sealing, stronger, yet more streamlined.

Conservatively rated, the Mac-it IB socket head cap screw provides a 26.53% improvement in working efficiency.

YOUR MAC-IT DISTRIBUTOR will be glad to give you the facts on the new IB's right now; or *write for new, illustrated specifications bulletin.*

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over 3500°F). The newer metals like beryllium, titanium, and zirconium require special filler metals and joining methods. Much development is still going on in this field. Absolute claims of e.g. 20,000 psi in shear or tensile strength used to be acceptable, but eventually the strength of the parent metal is going to be the relative reference point.

If we wanted to discuss the various filler metal compositions and their relationship to the joint strength, we would find out that up to now no specifications or standards have been given for a correlation of the physical properties of parent and filler metals and the strength of the joint design. In recognition of this gap, in 1958 the American Welding Society (AWS) Committee on Brazing and Soldering appointed a sub-committee to correlate filler metal compositions with the shear strength of brazed and soldered joints, on which the writer is a member.

From the statistical analysis of measured values of shear strength of actual joints all determinating factors like the influence of the operator, the design factor and the shear strength of the filler metals might be found.

From a theoretical paper of Goland and Reissner*, design factors for a single lap joint ranging from 2 to 4, depending on the stress concentration at the edges of the overlap, could be established up to the proportional limit of the joint. In this manner a safe overlap can be calculated where no deformation takes place. Eventually the goal would be to correlate the conventional destructive shear test with the calculated non-destructive safe loading limit.

Another task would be to determine the joint strength from the modulus of elasticity and the damping factor as determined ultrasonically. In this manner a comparison between brazing, soldering, and other metal fastening methods like gluing, riveting, and welding would be possible. •

*Journal of Applied Mechanics, March 1944, pages A17 through A27.

HI-FI QUALITY SECURED AT LOWER ASSEMBLY COSTS

Thomson Rivets and Rivet-Setting Machines used by H. H. Scott to standardize fastening procedures.

Any high fidelity hobbyist will tell you that H. H. Scott, Inc., Maynard, Mass., makes America's top quality in high fidelity equipment.

Here you see one of the finest stereo amplifiers made . . . in both chassis and final form. Components are securely and accurately held in uniform tension by 113 Thomson Rivets. H. H. Scott has standardized on Thomson aluminum rivets in one diameter and four lengths.

Rivets get their uniform clinch from any one of the eight Thomson Automatic-Feed Rivet-Setting Machines which H. H. Scott now uses.

All eight machines have identical tooling except for interchangeable anvils. Several sets of numbered, color-coded anvils cover all variations in assembly thickness. Change-over time is a matter of seconds.

E. G. Dyett, Jr., Purchasing Agent of H. H. Scott, reports, "The use of Thomson rivets and rivet-setting machines has produced assembly economies and resulted in lower over-all costs, while improving product appearance and mechanical construction."

Chances are the Thomson Fastening Man can help you improve product quality and reduce your costs. It costs nothing to find out. Make a date with him soon. You'll find him listed in the yellow pages of your phone book. In the meantime, you'll want Thomson's latest catalog. Write today for your free copy to Dept. AS.

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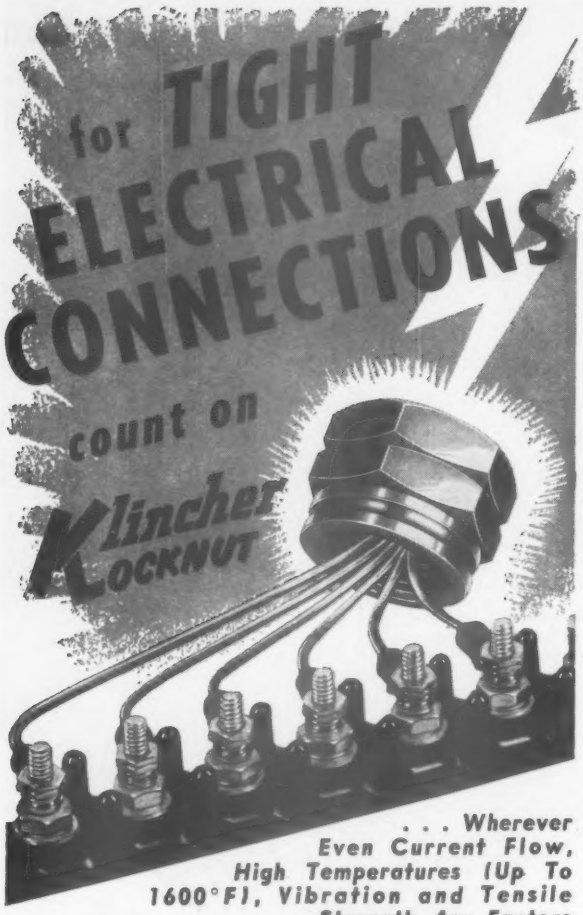

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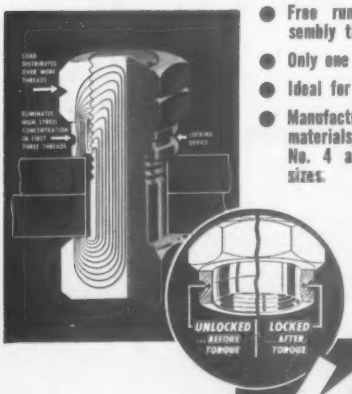
Inherent spring action in Klincher Locknut permits thermal expansion and contraction without loss of locking efficiency. With Klincher you can count on a TIGHT connection, through varying temperatures (up to 1600° F) . . . without disturbing intimacy of the contact. There's no danger of galling, seizure or stud wear, and nut remains fully re-usable.

On terminal strips, thermocouples, rectifiers and other vital connections, Klincher Locknuts are daily proving their worth.



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Modified Pressure Latch Helps . . .

ELECTRONIC CASES MEET RUGGED SPECS

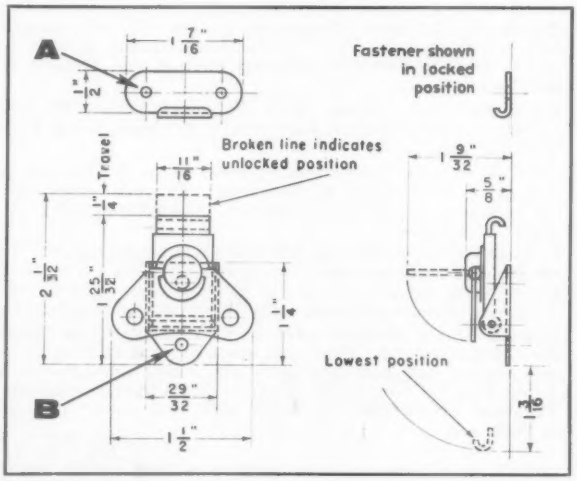
Electronic instrument reusable transit, shipping and carrying cases are manufactured in a wide range of sizes and designs by Skydyne, Inc., of Port Jervis, New York.

Certain military specifications, as for carrying cases for delicate instrumentation, have resulted in highly efficient internal shock mounting details to withstand military drop and vibration tests. Such shock mounting details vary from rubberized hair and plastic forms to elaborate spring-actuated mounts.

Recently, Skydyne added a complete line of molded fiber-glass cases both custom-designed and in a number of standard sizes. Originally these cases were equipped with standard hardware not intended for, nor particularly adaptable to the new cases. They fell short of the requirements of military specifications.

Fastening experts at Simmons were called in to review the problem. They came up with a modification of their Link-Lock pressure latch which solved the problem. This type of latch was designed to meet drop and vibration test requirements. It has a tensile strength of 300 pounds. Springless

In the Skydyne application of pressure latches on electronic carrying cases, the keeper plate (A) was eliminated and the mounting plate (B) was modified slightly for mounting on lower extrusion detail of containers.



Skydyne's molded fiber-glass cases meet rugged specifications. Pressure latches assure pressure-tight seal.

and positive-locking, the latch will lie completely flat, either open or closed.

Actually, the Skydyne containers incorporate an extrusion detail which lends itself readily to the use of pressure latches. The latch mounting plate was modified so that the Skydyne extrusion detail served as a locator, eliminating any necessity for fixtures to insure accurate fastener position.

ELIMINATES POSSIBLE LEAKAGE SOURCE

The engaging blade of the latch was also altered to fit properly over the cover extrusion. This eliminated the need for a keeper-plate normally used with the latch. This in turn eliminated through holes for fastening the plate to the container. In a sealed container such holes meant a possible source of leakage.

A pressure of 90 pounds easily closes the case. This is more than ample to insure a water and pressure tight seal. •

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A Report on Equipment for . . .

SHRINK-FITTING RING GEARS AUTOMATICALLY

A machine capable of producing 120 completed flywheel assemblies per hour has been installed in the assembly plant of a leading manufacturer of trucks and coaches. Specifically, the machine automatically shrink-fits a ring gear on any one of five types of flywheel assemblies.

Designed and built by the Induction Heating Corporation, the machine is said to be the first of its type developed for the automotive industry.

No skilled labor is required. Once the magazine itself has been loaded, it is only necessary to push a cycle "start" button. From that point on production takes place unattended.

The heart of the machine is a combination heating-coil-magazine. It consists of a water-cooled copper coil, operating directly from a 60-cycle tapped auto-transformer, complete with insulation, wear-resistant metal liner, and an automatic temperature controlling probe-type thermocouple.

In addition, it has an automatic stripping device, similar to a stacked-type record-changer, that strips off the bottom ring gear, moves it over the flywheel, and simultaneously supports the stack of ring gears still in the magazine.

The new "shrink fitter" is hydraulically operated with the exception of a fractional hp electric motor used to drive rollers of the flywheel assembly input station (right rear in photo).

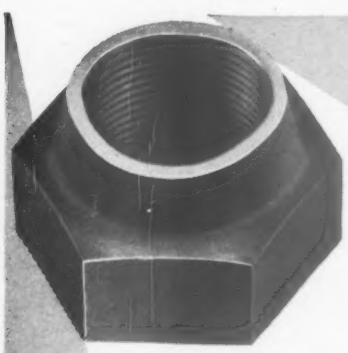
The entire setup is self-contained, including hydraulic pump cooling system, motors, actuating valves and press cylinder.

The gravity-fed flywheel blanks are delivered directly from previous operations to the motor-driven roller conveyor input. Travel through the machine is automatic, with the completed assembly ejected onto roller conveyors leading to the next operation. Adjustments and adaptors make it possible to process five types of flywheels—all using the same size ring gear. The ring gears may be batch loaded, or may be loaded by conveyor.

A FIVE-CYCLE OPERATION

The shrink-fitting operation consists of the following five cycles: heating the rings, stripping from stack and moving into press area, indexing of the flywheel blank under the ring gear, raising and pressing the flywheel into the ring gear against the

New One-Piece "Conelok" with prevailing torque



Three sectors of the tapered portion of the CONELOK nut are preformed inwardly (Fig. 1). When the Nut is applied to a bolt, these conforming sectors are elastically returned to a circular configuration and create an inward and downward pressure which produces intimate contact between the load carrying flanks of the nut and bolt threads (Fig. 2). The shape of the cone sector displacement insures conformity with the mating bolt and maximum friction contact area. . . . The closed stress path in the locking portion of the nut and the advantageous distribution of locking pressure, produce a locking device of high fatigue life . . . and equivalent locking force is exerted at only a fraction of the stress of any slotted type locknut. CONELOK maintains its locking action through many re-applications. . . . It is adaptable to high, and low torque assemblies . . . to high torque stop-nut applications . . . and may be obtained in sizes from No. 10 through 1½", Full and Thick dimensions are "Standard". . .

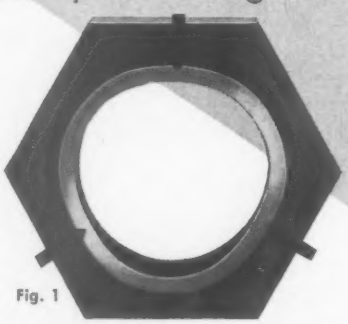


Fig. 1

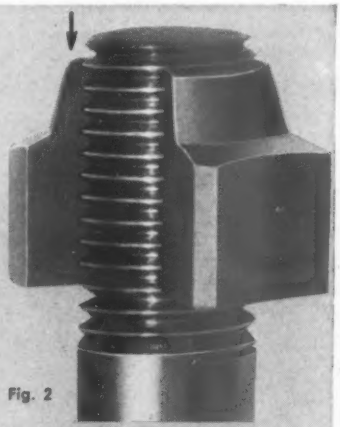


Fig. 2

Send for brochure which includes complete engineering specifications.

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an SPS company 44250 UTICA ROAD UTICA, MICHIGAN

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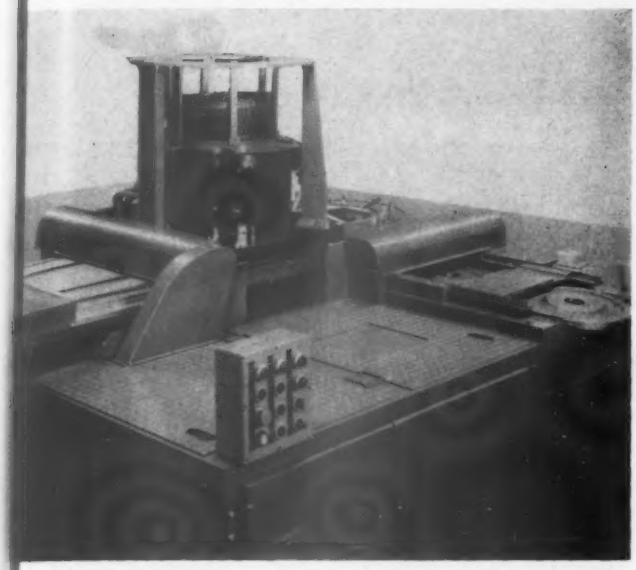


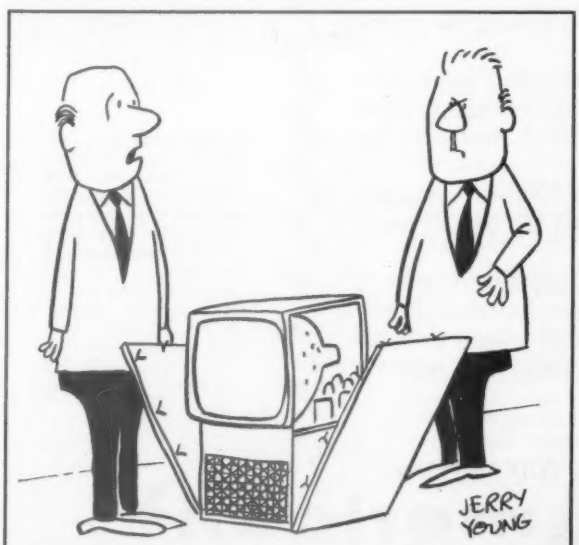
Now installed in an automotive plant, this hydraulically-operated machine was designed to shrink-fit ring gears on flywheels at rates up to 120 completed assemblies an hour.

bolster plate, and application of an air blast to chill and shrink the metal.

A sixth operation is performed by the action of the third cycle, which causes the finished assembly to be ejected automatically.

PUSHBUTTON CONTROL STATION

The pushbutton control station (center foreground) offers automatic cycle start. It is equipped with jog buttons to check the setup of each operation, emergency stop, plus indicating lights for monitoring conditions of heat on, pump on, standby and ready. •

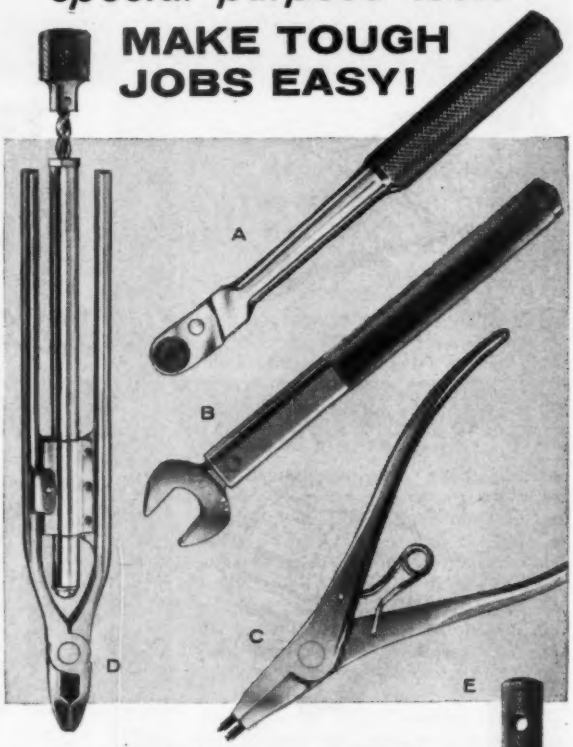


"Remember back in the early stages of design when you said that fastening was the least of our worries?"

MILBAR

special purpose tools

MAKE TOUGH JOBS EASY!



A. MILBAR CLOSE-CLEARANCE RATCHET WRENCH for tightening or removing twelve-point or hex-head screws and nuts. Fits in the tight spots where regular wrenches won't work. Smooth ratchet action. Several sizes available. Widely used in aircraft and missile industries.

B. MILBAR SNAP TORQUE TOOL—with pre-set torque. A "click" you can feel and hear tells when proper torque is reached. A choice of head types for specific jobs. Widely used on production lines in the automotive and aircraft industries.

C. MILBAR SNAP RING TOOL—the original and most widely used tool with replaceable points of different shapes and sizes. Tool lasts forever—just change points for the job at hand or when they wear out. Special points for holeless snap rings.

D. MILBAR WIRE TWISTER—for smooth, automatic one-hand operation. Extra large serrated jaws assure a longer life and non-slip grip. Spring return and squeeze release eliminates need for shifting hands. Twists and cuts wires with no waste motion.

E. MILBAR GEARED RIGHT-ANGLE TOOL—for easy access to "tight" spots. Fits all standard 3/8" drive extensions, sockets and ratchets. Reaches around corners and delivers increased torque for tightening or removal. Eliminates unnecessary removal of parts to get at the job to be done. Fully proven and tested by thousands of users.

Send for your free brochure describing these, and other, MILBAR Special Purpose Hand Tools. MILBAR has the engineering facilities and personnel to solve your special problems where sufficient volume is involved.

MILBAR CORPORATION

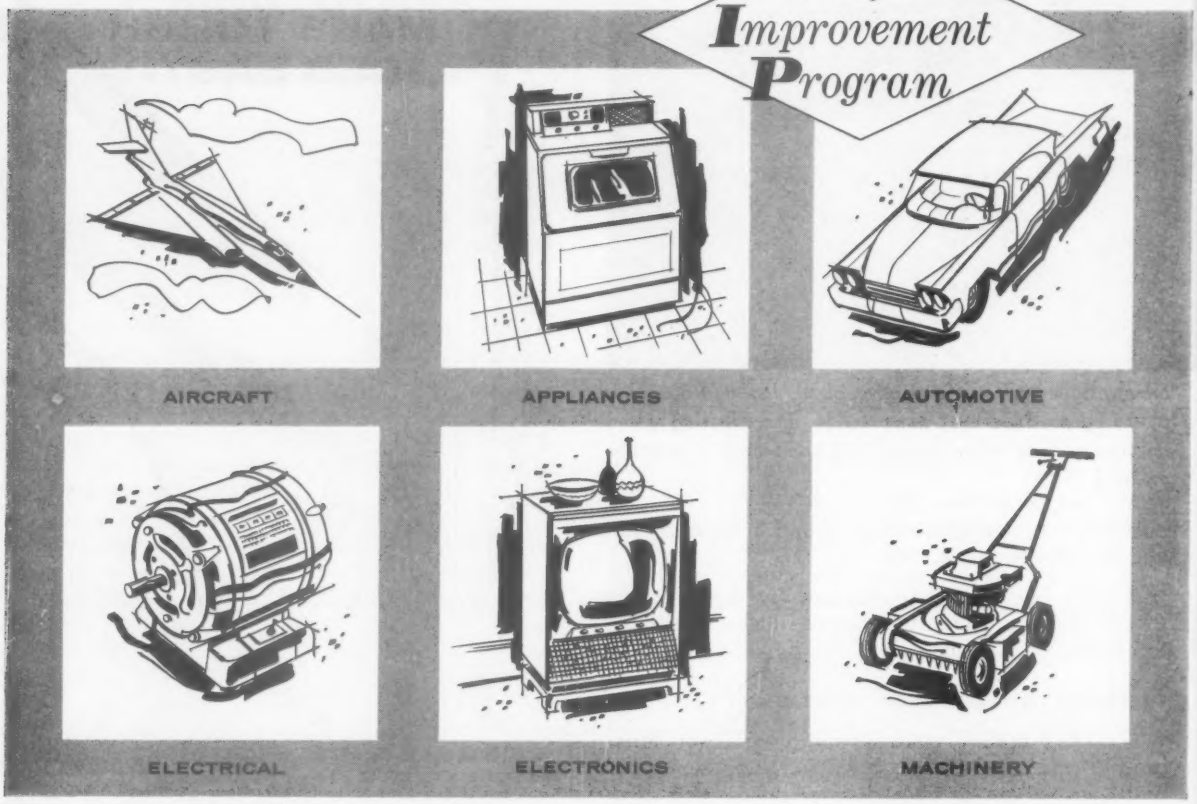
1900 EUCLID AVENUE • CLEVELAND 15, OHIO

Use postpaid card. Circle No. 241

Whatever You Assemble . . .

Cost Reduction is Not Necessarily Profit Improvement

Profit Improvement Program



American's Profit Improvement Program shows you why:

Cost reduction is not necessarily achieved by purchasing the cheapest materials.

Fasteners are a good case in point. If you assemble mass production items, assembly costs represent 50% to 75% of manufacturing charges. Of these charges, direct labor eats up more than 80%, fasteners less than 20%.

Consider then, how profits shrink when fastener failures — stripped threads, broken heads, defective heat treating, and the like — result in "assembly down-time" and customer rejects.

American's attention to its own manufacturing quality is part of our Profit Improvement Program for you. Your American Screw Company representative can give you complete information on the ways you can apply this program to building your own profit improvement.

Profit Improvement Program

If assembly is a factor in your production, find out how American products and services can contribute to your own profit improvement program . . . in new products, new applications, new packaging, new quality control techniques. All working to build greater profits for you.

The Biggest News in Fasteners comes from

American SCREW COMPANY

Willimantic, Conn. • Detroit, Mich. • Chicago, Ill.

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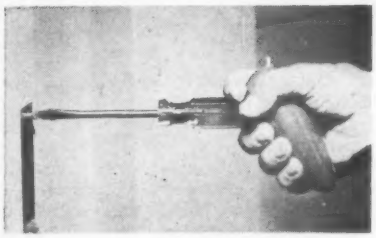
WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 70. Just circle the number on the card matching the number following the description. We'll do the rest.



(See 2)

TORQUE CHECKING FIXTURE SETS THREAD RING GAUGES

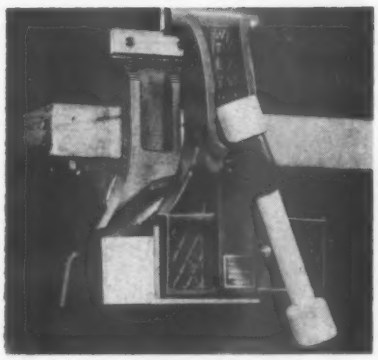
A torque checking fixture is adaptable to 11 different torque wrenches with ranges from 0 to 80 in.-gr. and 0 to 100 in.-lbs.

The TCF100-1 is said to have a normal accuracy of 2% of maximum skilled reading of the torque wrench. A special certified 1% torque wrench is supplied with the fixture.

Among the many no-operator-experience-necessary applications possible, are setting thread ring gauges uniformly, checking torsion spring ranges, checking turning screws and testing other small torque wrenches.

P. A. Sturtevant Co., Addison, Ill.

Use postpaid card. Circle No. 1



(See 4)

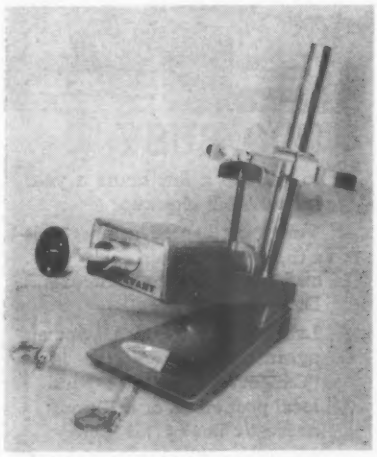
RATCHET SCREW DRIVER IS EASY ON THE HANDS

A ratchet screw driver is said to give five times more effective force than a conventional screw driver.

The Power-Egg features an egg-shaped Tenite handle which contains an aluminum ratchet mechanism. Three hardened SAE 1070 steel drivers (¼", 3/16", 5/16") complete the set. Simply insert the correct driver into the ratchet mechanism, lock it in place, then seat the screw by turning the handle.

Cuyahoga Products Corp., 10254 Berea Rd., Cleveland, Ohio.

Use postpaid card. Circle No. 2



(See 1)

SOLDERING UNIT FOR ELECTRONIC ASSEMBLY

A high-efficiency soldering unit is specifically designed for soldering small parts and assemblies.

By electronically generating heat within the work itself, the Model 5L is said to speed up production. The extremely rapid heating cycle available with this unit minimizes oxidation, scaling and damage to surface finish. Heating is uniform.

Excellent for true metal-to-glass and metal-to-ceramic seals, and for soldering brass, copper, tin, silver or steel, 100 lb. unit will find wide application on such parts as relay armatures, connectors, capacitors, transformer cans, resistors, instrument assemblies.

Weldotron Div., Mils Engineering Co., 780 Frelinghuysen Ave., Newark 5, N.J.

Use postpaid card. Circle No. 3

VISE COMBINES METAL, WOOD CLAMPING JAWS

A combination vise, equipped with wood and metal clamping jaws, turns quickly and simply from one type of work to the other. A half turn of the locking knob permits either set of jaws to be rotated into the correct working position. Another half turn of the knob locks the vise firmly in position, preventing inadvertent rotation.

With a maximum opening of 6", the Universal Turret Vise has a 3"x7" woodworking jaw, a serrated steel jaw measuring 1"x4", and a pipe holding capacity of ¼" to 4½".

Wilton Tool Mfg. Co., Inc., 9525 W. Irving Pk. Blvd., Schiller Park, Ill.

Use postpaid card. Circle No. 4

PARTS STRAIGHTENER FOR STAMPINGS, COIL, STRIP

A high-production 20" parts straightener is designed to reduce hand-fitting in assembling such products as office machines and appliances.

Accommodating flat stampings, coil and strip, the straightener will smooth and flatten to within .001"—.002" at feed rates from 10 to 50 ft/min. Design and construction features include a unique, two-point adjustment for fast, precise set-up and changeover, and four separate gear trains.

Cooper Weymouth, Inc., 603 Honeyspot Rd., Stratford, Conn.

Use postpaid card. Circle No. 5

DEVICES CHECK WELDING MACHINE PERFORMANCE

To establish the magnitude of secondary currents in standard resistance welding and of secondary currents and tip pressure in gun-type resistance welding, two transducers or transmitters have been developed.

Designed for use with an oscilloscope or a direct-writing recorder, the first of these accommodates electrode holders from 1¼" to 1¾" diameter. It is

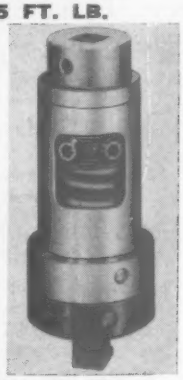
held in position by spring clips which automatically adjust to different size holders and is calibrated in terms of millivolts per thousand amperes.

The second instrument, designed primarily for use on gun-type resistance welders but adaptable to other types of resistance welders as well, registers tip-pressure and secondary welding currents simultaneously, recording them on a double channel direct-writing oscillograph.

Control Devices Inc., 925 E. Eton, Birmingham, Mich.

Use postpaid card. Circle No. 6

DRIVING HEAD CONTROLS TORQUE TO 225 FT. LB.



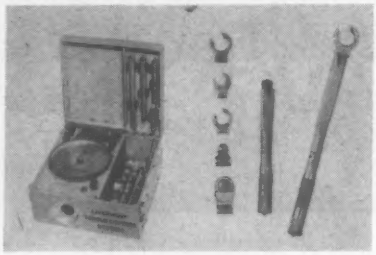
A driving head is available in four sizes and controls torque from 75 in.-lb. to 225 ft.-lb.

The TitanTorker gives an audible signal as pre-set torque is reached and internal balls are forced out of their sockets and overrun. The tool is adjustable with a hex-key wrench.

Titan Tool Co., Main St., Fairview (Erie County), Pennsylvania.

Use postpaid card. Circle No. 7

TORQUE WRENCH WITH INTERCHANGEABLE HEADS



Livermont Torque Control System consists of a torque wrench with interchangeable heads that permits one wrench handle to do the work of many conventional wrenches. It is a portable analyzer with universal adapter for fast, accurate testing and setting of nearly every wrench type and size from ¼" to 3", and in torque values up to 1600 in.-lbs.

Richmont, Inc., 922 South Myrtle Ave., Monrovia, Calif.

Use postpaid card. Circle No. 8

PARTS STORAGE CABINET WITH GLASS-FRONT BINS

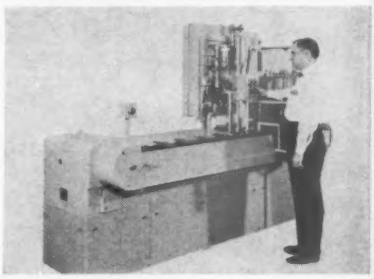
A portable all-metal storage cabinet features bins with high strength glass fronts.

The "UC" cabinet comes with 6, 12, or 24 bins, each with a removable divider which automatically doubles storage capacity. Bins are spill-proof, yet open at a slight touch. There is space above glass fronts for placing identification labels that come with each unit. Entire cabinet of welded heavy gauge steel finished in baked enamel Hammertone blue.

Bowers Mfg. Co., 105 Michigan St., Toledo 2, Ohio.

Use postpaid card. Circle No. 9

AUTOMATIC ASSEMBLY UNIT FROM STANDARD BASE

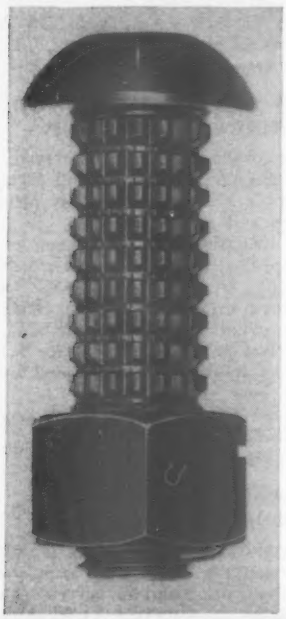


A standard indexing chassis has been engineered to automatically assemble 1200 aluminum auto engine components per hour.

The over-and-under series Automator indexes 8½" between stations and assembles a 3¼"x6½" four-part component. It incorporates an air hydraulic booster which operates a stitching die.

The standard base can be developed to suit virtually any assembly operation, claims the manufacturer. The

NEW!



ANCO

HIGH TENSILE

Structural Rib Bolts

For Structural Joints Requiring The Extra Strength Of High Tensile Steel

- Interrupted ribs fill hole to create joint in initial bearing . . . body-bound feature eliminates possibility of joint slippage
- Flat head and tapered ribs permit easy driving . . . ribs do not peel off or pack under head
- Designed with proper rib length . . . full thickness of plates in full bearing . . . no steel rides on threads
- Use with ANCO Lock Nuts for fast one-man assembly
- Can be furnished black or hot dip galvanized
- Technical data, price quotations and copy of university test reports upon request

AUTOMATIC NUT COMPANY
INCORPORATED
LEBANON, PENNSYLVANIA

Use postpaid card. Circle No. 243

TOO BUSY

to give up a few hours a year for a health checkup?

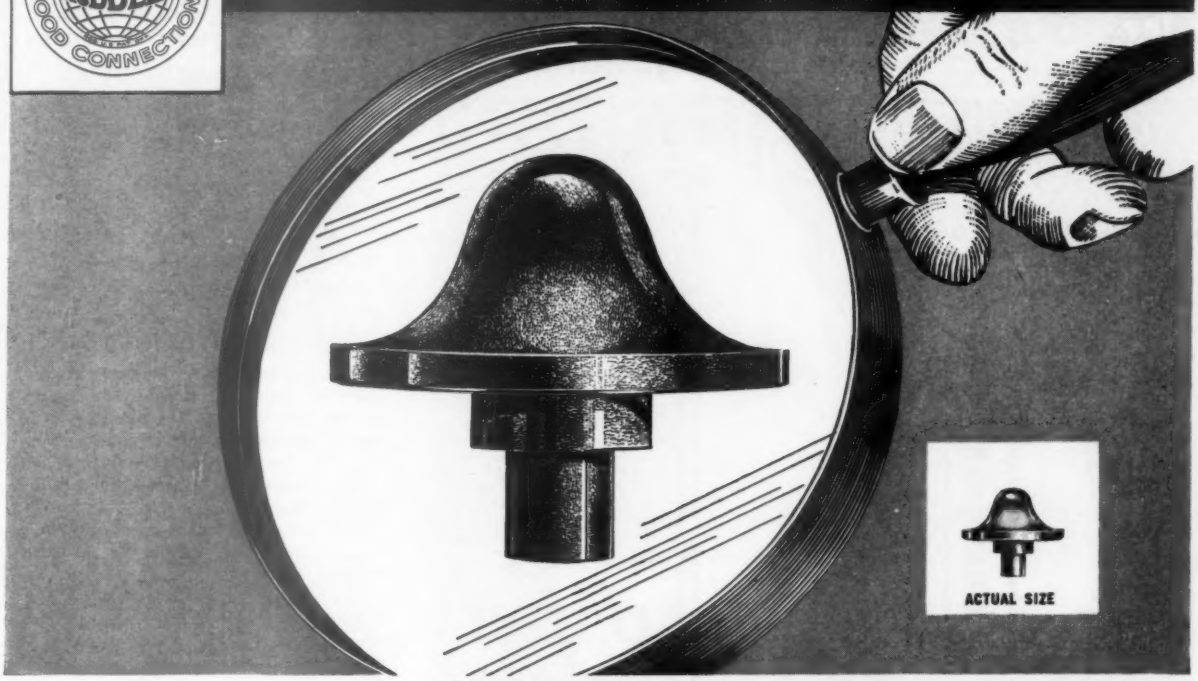
Your best cancer insurance is a thorough checkup every year, and alertness to Cancer's 7 Danger Signals.

Learn how to guard yourself against cancer. Write to "Cancer" in care of your local post office, or call your nearest office of...

American Cancer Society

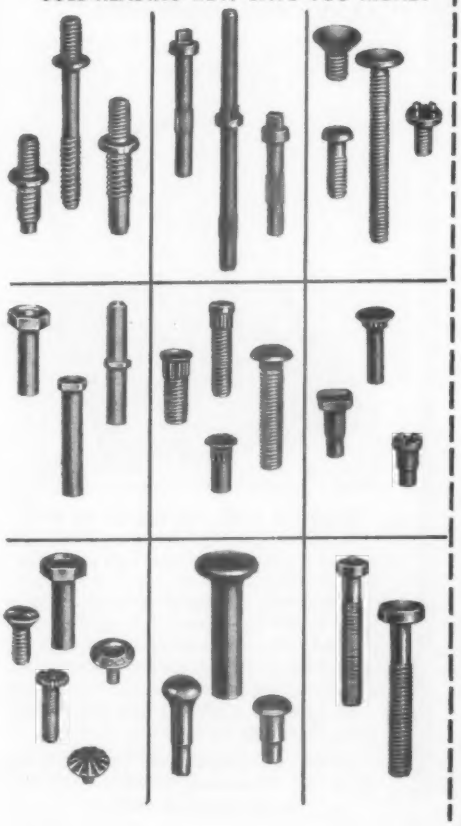
IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

COLD-HEADING does it again!



Screw-machining this click button wasted almost 50% of brass bar stock. Hubbell cold-heading improved quality, speeded production, and cut cost 36%

IF YOU USE PARTS LIKE THESE,
COLD-HEADING MAY SAVE YOU MONEY



36% SAVING
on BRASS CLICK BUTTONS

Redesigned for cold-heading, this brass click button now costs 36% less than when it was screw-machined from bar stock with almost 50% waste of material.

Also important in reducing its cost is the high-speed production that cold-heading makes possible: 60 buttons per minute *vs.* 5.5 with screw machines.

But that's not all! The cold-headed buttons are stronger, more accurately dimensioned, and more uniform in quality and finish.

SEND FOR FREE ANALYSIS AND ESTIMATE!

If your operation uses large quantities of small metal parts formed on automatic screw machines, equal or greater savings may be possible by having Hubbell produce them by cold-heading.

It will cost you nothing to find out!

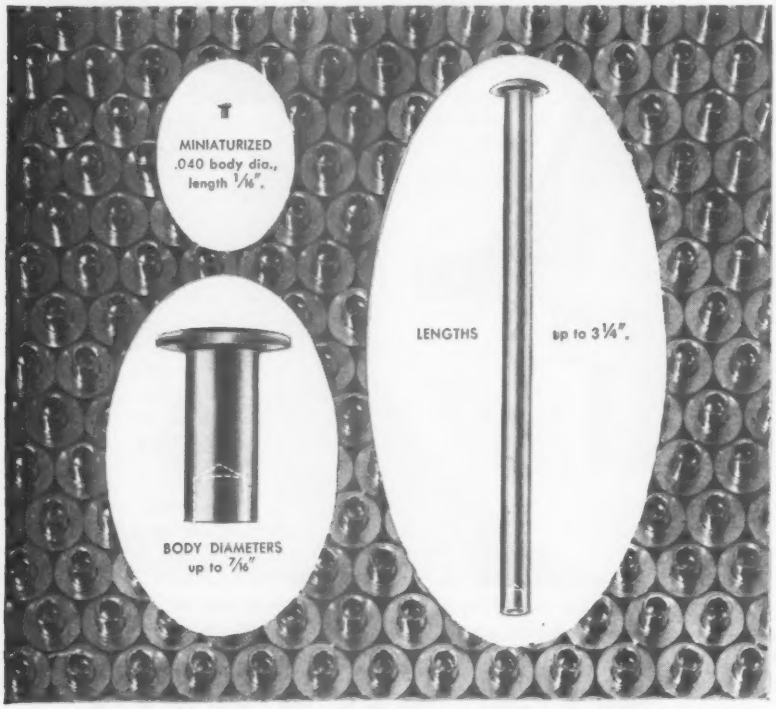
Simply mail the part or the blueprint, and we will have it analyzed by our staff of cold-heading specialists. If savings or product-improvements are possible, we'll give you the facts and figures. In any event, there's no obligation on your part.

HARVEY HUBBELL, INCORPORATED

MACHINE SCREW DEPT., BRIDGEPORT 2, CONNECTICUT

Use postpaid card. Circle No. 244

Look at this Size Range of Semi-Tubular Rivets... it's the way to lower cost



Miniaturized components and also large complete assemblies can now have all the money-saving advantages of using single and multiple automatic riveting. This is due to the wider size range of semi-tubular rivets now available and which can be used in conjunction with motor and pneumatic driven automatic riveting machines.

Today, there is hardly a fastening problem, involving even fragile materials, that does not warrant consideration of low-cost semi-tubular rivet setting.

Our Factory Riveting Specialists are ready to help you obtain the REAL COST FACTS on your own specific fastening problem. There is no obligation.

FOR YOUR FILES

Chicago Rivet Catalog describes 1388 standard tubular and split rivets and 25 single and multiple automatic rivet setters.

AIR-POWERED RIVETING

contains description and specifications of 8 single, multiple riveters— also rivet setters designed for automated operation.

Chicago Rivet & MACHINE CO.

946 So. 25th Ave., Bellwood, Ill. (Chicago Suburb)
Branch Factory: Tyrone, Pa.

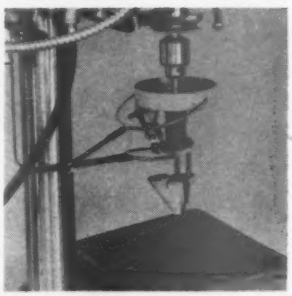
Use postpaid card. Circle No. 245

chassis is convertible to oval track operation.

Benerson Corp., Station A, Box 4126, Evansville, Ind.

Use postpaid card. Circle No. 10

AUTOMATIC SCREWDRIVER FITS ON VERTICAL SPINDLES



A magazine-fed screwdriver attachment for use with a drill press or similar machine having a vertical spindle will automatically drive screws from No. 0 to No. 14 in lengths from 3/32".

The Russell Auto-Feed is torsion spring torque controlled with a slip clutch which clicks as pre-set torque is reached. The spring is spanner wrench adjustable.

The units are furnished in seven different sizes.

H & G Sales Corp., Box 1589, New Haven 6, Connecticut.

Use postpaid card. Circle No. 11

RETAINING RING KIT HANDY FOR DESIGNERS

Retaining rings are packed in a 12" x 12" shock-proof plastic case that tells you at a glance sizes and types of rings in the kit.

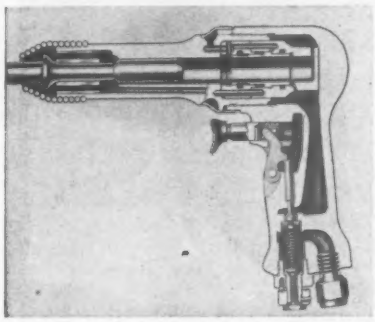
Some 400 cadmium plated Truarc rings in 84 sizes from ¼" to 2½" represent 70% of the sizes being used in industrial, automotive, aircraft and marine applications.

Rings meet NAS 669 and 670 standards. Price: $34.50.

Packaged Merchandise Co., 3065 W. 117th St., Cleveland 11, Ohio.

Use postpaid card. Circle No. 12

"SHOCK ABSORBER" RIVETER FOR LIGHT DUTY WORK



An air-powered riveter is designed to cover a wide range of light riveting, chipping, scaling, calking and nail-driving. Its unusual features are a rubber-bonded nozzle and great power for its size. The nozzle reduces the high-frequency vibration formerly transmitted from tool to operator and dampens the sound amplifying effect of the hollow barrel.

Better control is claimed by accurate throttling, simple power adjustment and compact design.

The tool comes in four power sizes with a choice of seven throttle handles, including offset design, pistol grip, and button throttle handles. Capacities range from ⅛" to ¼" diameter cold rivets (aluminum, dural or soft iron).

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

Use postpaid card. Circle No. 13

43-PIECE TOOL KIT FOR ASSEMBLY, MAINTENANCE

Wrenches, screwdrivers, pliers, pencil-type soldering irons and accessories comprise the 5343-ET-B tool kit designed for electronic assembly and maintenance. The 43 tools are made from special heat-treated alloy steel for light weight.

Screwdrivers with tips the same width as shanks allow drivers to follow screws below surfaces. The set also includes a midget tapered-nose cutter, midget gripping pliers and needle-nose gripper cutter. Square-drive ratchet adapters, screw starters, open end wrenches come in many sizes.

Snap-On Tools Corp., 8033 28th Ave., Kenosha, Wisconsin.

Use postpaid card. Circle No. 14

CAMLOC *low cost/light weight*

5F series

Camloc's new small, lightweight 5F Series features high strength-weight ratio plus the quick-operating advantages of a ¼-turn fastener... in a size and weight that offers new design possibilities to original equipment manufacturers! Particularly adaptable to thin materials and miniaturized equipment like airborne electronics, small electro-mechanical and computing devices and communications components. Ideal for attaching lightweight components in "packaged" equipment or for holding access panels on everything from washing machines to radar units.

Offered in many different head styles. Complete specifications will be sent to you on request.

CAMLOC®

CAMLOC FASTENER CORPORATION

14 Spring Valley Road, Paramus, N. J.

WEST COAST OFFICE: 5410 WILSHIRE BLVD., LOS ANGELES, CAL.
FORT WORTH OFFICE: 2509 W. BERRY ST., FORT WORTH, TEXAS

Use postpaid card. Circle No. 246

BRISTOL SOCKET CAP SCREWS MEET NEWLY ESTABLISHED INDUSTRY STANDARDS

Have higher strength, greater holding power than ever.

Bristol socket cap screws are now available to meet *all* the recommendations of the Socket Screw Manufacturers' Committee standards.

These new standards which increase the head diameter of socket head cap screws to 1½ times the body diameter—plus Bristol's advanced manufacturing techniques and stringently applied quality-control methods—are setting a new high for socket screw performance. Check these design advantages:

- Greater bearing surface under the head because of increased head diameter—for maximum holding ability.
- Less need for washers, less indenting of metal under the head.
- Greater holding power under shock and vibration.
- Larger socket—you can wrench-up screw tighter.
- Greater engagement of head with work, greater power to clamp parts, provided by torque-lock construction.

These new Bristol socket screws are just one important example of the way Bristol research and engineering develops new products to meet the needs of modern manufacturing. They're an example, too, of the reasons you'll find precision Bristol socket screws—both hex and Bristol Multiple-Spline—in such a wide variety of modern equipment today. They're used by the millions in machinery, machine tools, appliances, instruments, computers, aircraft and missiles (including count-down, tracking, and ground-support equipment), and wherever highest standards of quality and reliability are imposed. A.9.2.

ACCO

TRADE MARK BRISTOL'S REG. U.S. PAT. OFFICE

Old dimensional standards will continue to be available.

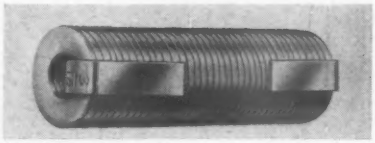
Precision socket screw manufacturers since 1913
Bristol's Hex Socket Screws
Bristol's Multiple-Spline Socket Screws
*Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diameter.

THE BRISTOL COMPANY
SOCKET SCREW DIVISION
WATERBURY 20, CONN.

Use postpaid card. Circle No. 247

WHAT'S NEW IN FASTENING AND JOINING

For further information on any of the fasteners listed here, use the handy postpaid card opposite page 70.



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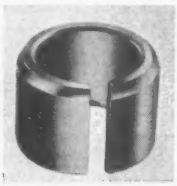

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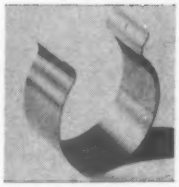

(See 21)

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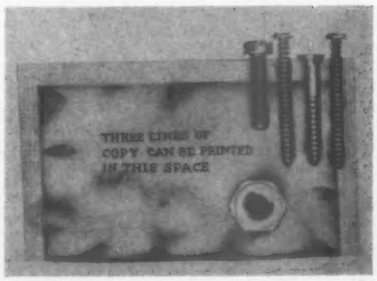


(See 23)

WASHERS PACKED IN CLIPS, TRANSPARENT TUBES

Plated wrought washers are packaged to simplify handling and application by users: in compact Klip-Pacs, plastic tubes, or in one and five lb. packages.

All standard washers from 3/16" to 5/8" bolt size can be supplied in pre-counted rolls held together by metal clips with size stamped on the clip for identification.

One plastic tube holds 26 plated washers in a variety of sizes. Another type contains 3/16", 1/4" and 5/16" sizes only. These tubes are packed 15 and 24 per box respectively.

Wrought Washer Mfg. Co., Dept. AFE, 2202 S. Bay St., Milwaukee 7, Wis.

Use postpaid card. Circle No. 20

SPRING CLIP RETAINS GRIP DESPITE REPEATED FLEXING

Prestressed spring steel clips will return to original shape and retain their grip despite repeated flattening and flexing. Each clip is a fractional coil of a Neg'ator constant-force spring.

The clip has a natural ID of 1 7/8" and is typically used to lock the leg sections of upright portable scaffolding.

Hunter Spring Co., 1 Spring Ave., Lansdale, Pennsylvania.

Use postpaid card. Circle No. 21

BLIND CLINCH-TYPE SANDWICH PANEL FASTENER

A blind clinch-type fastener is designed primarily for sandwich panels which employ fibrous type skins or cover sheets such as plywood, where the tensile strength of the cover material is low.

For ease of handling, the two-piece fastener is provided as one pre-assembled part. The fastener is installed in one side of the sandwich panel and does not affect or disfigure opposite panel cover sheet.

The knurled portion of the fastener sleeve bites the inside surface of the drilled hole in the cover sheet, while the standard pneumatic gun used for installation, spreads the fastener prongs like fingers on the inside surface of the cover sheet, holding the fastener in the panel.

The Delron Company, Inc., 5224 Southern Ave., South Gate, Calif.

Use postpaid card. Circle No. 22

ONE PACKAGING OPERATION SORTS, FILLS, SEALS PARTS

An assortment of fasteners can be packaged in a variety of sizes in one operation in either translucent or kraft opaque bags up to 4 1/2" x 4 1/2". The Fasten-Pak process will also print up to three lines of text on the side of the package.

Parts available include machine and sheet metal screws, square-head set screws; square, hex, cap, wing and round nuts; machine and carriage bolts; washers; cotter pins and nails.

Mid-Continent Screw Products Co., 5844 N. Broadway, Chicago 40, Ill.

Use postpaid card. Circle No. 23

BUSHES HELD IN PLACE BY SPRING TENSION

Tension Bushes are suited for oscillating or low RPM bearing applications where there is considerable wear and little lubrication possible. They are hollow cylinders slotted along their length and made of heat-treated spring steel of high elasticity and great wear resistance. These bushes are held in place by spring tension and can be easily exchanged when worn.

John Gillen Co., 2540 South 50th Ave., Cicero, Illinois.

Use postpaid card. Circle No. 24

EPOXY RESIN ADHESIVES CURE AT ROOM TEMP.

Epoxy resin adhesives cure at room temperature and under contact pressure to a strong solid state without forming volatile by-products.

EC-1294 cures to a clear, hard, light, amber-colored material that has good machining properties and adheres to aluminum, steel, brass, glass and many plastics. The addition of aluminum powder makes it a metallic appearing sealer for filling-in or eliminating surface cracks.

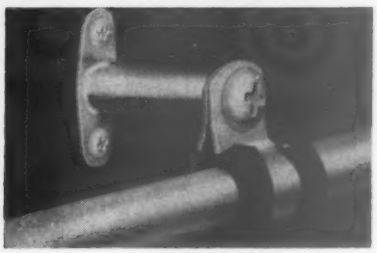
EC-1474 is designated for use, where cost is a major factor and high shear strength and light color are not necessary. It cures with the addition of EC-1475 accelerator.

AC&S Div., Minnesota Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.

Use postpaid card. Circle No. 25

RIGHT-ANGLE FASTENERS FOR STOCK MOUNTNG

Two new types of one-piece right-angle self-locking fasteners are suitable for medium to light loads. The fasteners are designed for attachment of



instrument panels, shock mounting of delicate equipment in packaging containers, tubing and wiring harness.

Incorporating both self-locking device and mounting bracket in one unit, the fastener attaches directly to the structure without a separate mounting bracket.

The fasteners are designed around a Heli-Coil mid-grip insert of stainless steel which locks and maintains a constant spring-pressure on the screw threads. Configurations in lengths from 0 to 3" in .020" increments are available.

Western Sky Industries, 2301 Cloud Way, Hayward, California.

Use postpaid card. Circle No. 26

TAPPING SCREWS PACKAGED IN 1000-PIECE QUANTITIES

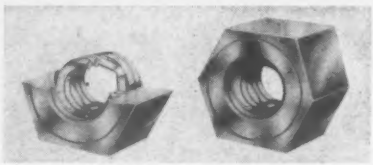
Pan head type-A tapping screws are being packaged in 1000-piece quantities for the convenience of sheet metal fabricators.

The factory-sealed Grand-Pak will be carried in stock by distributors in a variety of sizes. In the Hi-Thread screw the last thread terminates in an annular orifice in the head itself, providing an extra measure of holding power.

Parker-Kalon Div., 1 Peekay Drive, Clifton, New Jersey.

Use postpaid card. Circle No. 27

LIGHT ALUMINUM LOCKNUT FOR HIGH-TEMPERATURE USE



A self-locking nut incorporates a spring-temper stainless steel wire form in an aluminum body. The Tru-Lok meets the performance requirements of MIL-C-25027 for 550°F operation.

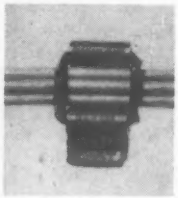
Configurations shaped into the middle winding of the coil make for unvarying torque and locking friction. Wear is negligible due to hardness and microfinish of the wire form. Strength-to-weight ratio is high.

The fastener's body may be specified in other materials.

Waltham Precision Instrument Co., 221 Crescent St., Waltham 54, Mass.

Use postpaid card. Circle No. 28

MINIATURE NYLON CLIP FOR WIRE HARNESSES



A miniature version of the Insuloid Cradleclip will accomodate diameters from 5/32" to 1¼", enlarging the company's line to from 5/32" to 2¼".

The U-shaped nylon cradle accomodates a bundle of wires or a component and an extensible Neoprene clip cinches across the U-opening to lock under an inverted lip on the other side of the cradle.

Tests are reported to have shown the mounted fastener to be practically unaffected by vibration and low atmospheric pressures. Samples available.

Electrovert Inc., 124 E. 40th St., New York 16, New York.

Use postpaid card. Circle No. 29

QUARTER-TURN FASTENER FOR REMOVABLE PANELS

A new fastener for removable panels of advanced aircraft and missiles is now being developed for production by the Camloc Fastener Corporation, Paramus, N.J. The structural, quick-release mechanism possesses aerodynamic flushness necessary for high-mach performance. The fastener locks and releases with a quarter turn.

Navan Products, Inc., 900 N. Sepulveda, El Segundo, Calif.

Use postpaid card. Circle No. 30

BAR STOCK IN COILS UP TO 2100 LBS.

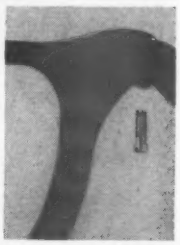
Bars in coils up to 2100 pounds, will be available for the first time at Gary Steel Works of United States Steel with the modernization of the 10-inch No. 4 bar mill.

The new product line will be expanded to include rounds, squares, and hexagons in sizes ⅜" to 1½". Expected completion date is scheduled for the third quarter of 1960.

U.S. Steel Corp., 208 S. LaSalle St., Chicago 90, Ill.

Use postpaid card. Circle No. 31

SELF-LOCKING SCREW FOR EYEGLASSES



A self-locking screw for eyeglasses features flush protrusion, permitting finger pressure insertion and elimination of abraded locking materials; high torsional strength and gradual torque build-up to resist breaking, and minimum thread engagement for positive locking action. The screw is vibration and shock resistant. It is removable and has high reuseability.

The screw is said to have wide usage in instrument applications and in all areas where miniature self-locking screws are required.

Long-Lok Corp., 2601 Colorado Ave., Santa Monica, California.

Use postpaid card. Circle No. 32

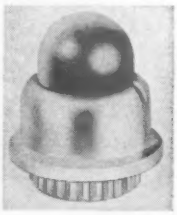
CORROSION RESISTANT FINISH FOR FASTENERS

A zinc finish for steel bolts and nuts, said to possess twice the corrosion resistance of conventional electro-zinc finishes, is now being applied to a line of electro-zinc-coated nuts and bolts, at no increase in price. Brite-Gard finish is particularly recommended for use in corrosion atmospheres.

Bolt and Nut Div., Republic Steel Co., Republic Bldg., Cleveland 1, Ohio.

Use postpaid card. Circle No. 33

MINIATURE NYLON CLINCH NUT FOR ELECTRONICS



A miniature self-locking clinch nut with an integral nylon cap is designed to meet the strength, vibration and shock requirements imposed upon avionic and electronic components.

Type NKCFM's nylon cap protects the bolt threads against corrosion, chafing of wires by exposed bolt ends, limits corona and electrical discharge in high voltage circuits, and seals internal or external pressures up to 80 psi past the bolt threads. The one piece cap and locking element will perform under environmental temperatures up to 350°F.

Installation may be by hand or for volume production, using a riveting or spinning technique. Recommended minimum material thickness is .030" for practical flush installation.

completed parts...

COLD HEADED

from wire!

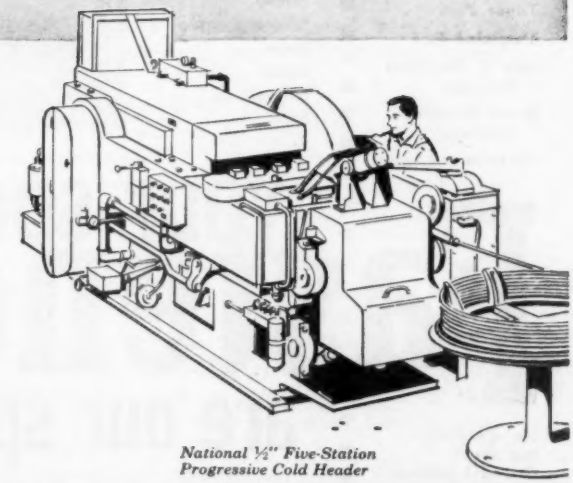
Top row, left to right: pipe plug, ball seat for push-rod end, splined square-head shaft. Middle row: commutator bar, solenoid contact, wire clamp. Bottom row: distributor cap insert, transistor case, spacer, link, distributor cap center wire insert.

All of the odd-shaped metal parts above were developed for fast, accurate production on National Cold Headers.

Complete and ready to use, these parts are made from wire, start-to-finish in one compact machine, at unbelievably high speeds with excellent die life, in most cases with no loss of material!

Production ranges from 40 parts per minute with stock of 1½" diameter up to 450 per minute in the ⅛" size. The jobs illustrated average 161 per minute.

Have you investigated Cold Heading? If you now have headers, have you considered widening your range and type of work to meet the growing requirements of metalworking?



National ½" Five-Station Progressive Cold Header

Founded 1874—DESIGNERS and BUILDERS of MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS CO-PIONEERS WITH INDUSTRY OF ADVANCED METALWORKING PRODUCTION METHODS

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U. S. A.

HARTFORD DETROIT CHICAGO

Use postpaid card. Circle No. 248

The nut is available in thread sizes 4-40 through 10-32.

Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, New Jersey.

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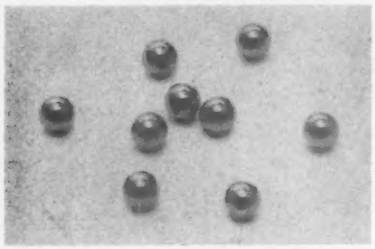
SOLDER PREFORM BALLS FOR AUTOMATIC FEEDING



Solder balls, designed for automatic feeding production processes, are manufactured of tin-lead, indium, silver, precious metals, and fusible alloys containing bismuth and cadmium to suit any specific temperature and strength requirement. The preforms can be loaded into jigs and rolled into place automatically.

Available in diameters from .002" through .125" and dimensionally accurate to plus or minus .001", these spheres assure a correct volume of solder.

Alloys Unlimited, Inc., 21-01 43rd Avenue, Long Island City 1, N.Y.

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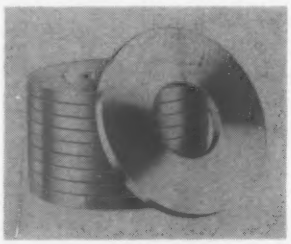
MARKING IDENTIFIES HARDENED FLAT WASHERS



Flat structural washers are now stamped with the letter "A" to identify the manufacturer's specially hardened product. The high-strength washers are quenched and drawn for a uniform hardness to ASTM specification A-325.

American Nut & Bolt Fastener Co., 2029 Doerr St., Pittsburgh 33, Pa.

Use postpaid card. Circle No. 36

SEALING NUTS ALSO RESIST VIBRATION

Nuts that seal against dirt, liquids and other undesirable materials and minimize damage and noise from vibration comprise a free-turning ⅜" hex nut with 10-24 NC2 thread which turns independently of the washer assembly.

A cupped heat treated spring steel washer ⅝" OD acts as a lock washer. There is a positive bond between washer and sealant. Height of Plastisol sealant is .125". The unicellular sponge-sealing material can be molded to various product configurations to suit required applications. Samples.

Industrial Hardware Sales, Dept. P., The Stanley Works, 195 Lake St., New Britain, Conn.

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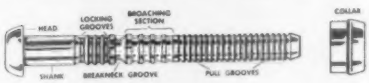
TWO LOCKBOLTS ARE SELF-BROACHING, SELF-SIZING



Self-broaching and self-sizing lockbolts automatically produce interference-fits.

The 10LP broaching fastener (pictured) has broaching teeth between pull grooves and breakneck groove. The 9LP self-sizing fastener is similar, but has a single extruding land between the pull grooves and breakneck groove.

The fasteners are installed with standard power tools adapted for double-driving application with Model 1054 air valves.

The new pin designs are recommended for joining aluminum alloy components.

Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Michigan.

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Bolts • Nuts
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Monel
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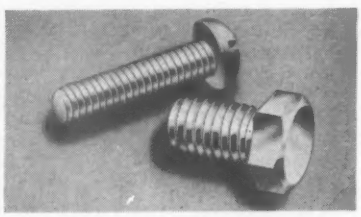
Steel



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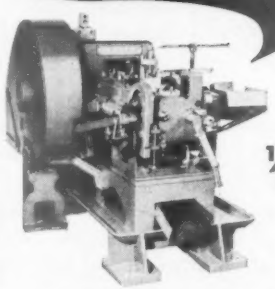
BEHR SINGLE and DOUBLE STROKE
COLD HEADERS
FOR UPSETTING AND FORGING BOLTS, SCREWS, RIVET HEADS AND OTHER SIMILAR SHAPES!



1/4"x2" CAPACITY

Capacity of wire, 1/4"; Stroke, 3"; Maximum length of cut-off, 2-7/8"; Maximum length of blank under head, 2"; Diameter and length of heading die, 1-3/4" x 2-1/2"; Diameter of finished punch, 1-1/4" x 2-1/4" long; Speed — Number of pieces per minute, 175; Number of strokes per minute, 350; Lubrication, Force Feed; Weight, 6000 lbs.; Overall dimensions, 81" x 46" x 51"; Motor, 5 HP, 3 phase, 60 cycle, 220/440 volts. Each header complete with motor, push button station, and foot brake.

MANVILLE 250C HEADER PARTS AVAILABLE FROM STOCK

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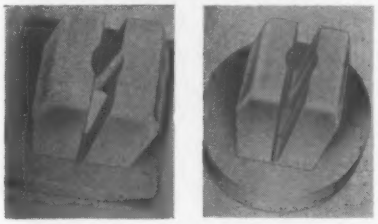
NYLON GROMMETS ADDED TO LINE OF STANDARDS



Blind snap-in retained nuts made of strong, moisture-conditioned nylon, are now available in new standard sizes from stock.

Design modified Plasti-Grommets provide easier snap-in entry of the grommet to work panel. The parts accommodate a very high percentage of mass-assembly requirements where screw sizes No. 6, 8 and 10 are used.

Fastex Div., Illinois Tool Works, 195 Algonquin Rd., Des Plaines, Ill.

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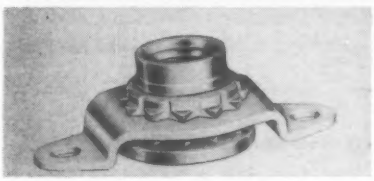
FLOATING ANCHOR NUTS FOR UP to 1400°F SERVICE



High temperature applications requiring high torque-out and push-out characteristics are satisfied by two new high tensile, self-locking, all-metal anchor nuts.

Look-alikes, the part numbers are F19270 made of A286 stainless for 1200°F use, and F19271 of M252 for 1400°F service.

Since the basic nut elements in these floaters are approved parts currently in use—the 1200°F H33 and 1400•F H19083—retainers may be of any material compatible with the structure to which they may be fastened.

Kaynar Mfg. Co., Inc., Kaylock Division, Box 2001, Terminal Annex, Los Angeles 54, Calif.

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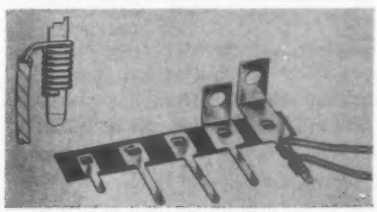
WIRE WRAPPING TERMINALS SPEED CIRCUITRY ASSEMBLY



Terminals which eliminate hand tie and soldering, speed production of electronic assemblies. The single square lug of Wrap-A-Wire terminals prevent turning.

Each terminal can take one or more wire leads using wire wrap methods.

Malco Mfg. Co., 4025 W. Lake St., Chicago 24, Illinois.

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Now! Special, Timesaving Snap-on Tool Kit for Electronic Assembly and Maintenance

5343-ET-B ELECTRONIC ASSEMBLY TOOL SET

43 tools including ¼-in. sq. drive ratchet, extensions, Flextension, universal joint and 2 plastic-handle drivers; 9 sockets, 3/16" to ½"; 4 open-end wrenches, 3/16" to 7/16"; 4 Boxocket® wrenches, 3/16" to 11/32"; 10 screwdrivers, Phillips and standard bits; screw starter; 6 pliers and cutters; soldering iron.

This new SNAP-ON kit of specially selected tools is made up to reduce costly labor time on electronic assembly and maintenance work.

Tiny wrenches slip between closely fitted assemblies on nut-turning jobs. Smooth, well-shaped handles aid efficiency of both men and women assemblers.

Thin blade tips on screwdrivers, with tips the same width as shank diameter, follow screws below surfaces, can reach in among intricate assemblies.

Pliers include needle nose, duck bill and diagonal cutter with plastic-covered handles — also midget tapered nose cutter, midget gripping pliers and special needle nose gripper-cutter. Both diagonal cutters have plastic jaw inserts which hold wire cutoffs.

Eighteen-watt, pencil-type soldering iron maintains constant 850° F. tip temperature for work on printed circuits or tiny assemblies. Entire set fits neatly in strong metal box for convenient carrying or storage.

These tools are top quality throughout — cost less because they outlast cheaper tools over and over. Use of fine steels permits light weight, slim, yet strong, tools that fit properly.

Put new speed on your assembly line with this SNAP-ON electronic tool set or one especially selected for your specific jobs. Write us or call your nearest SNAP-ON branch.

SNAP-ON TOOLS CORPORATION

8033-K 28th Avenue • Kenosha, Wisconsin

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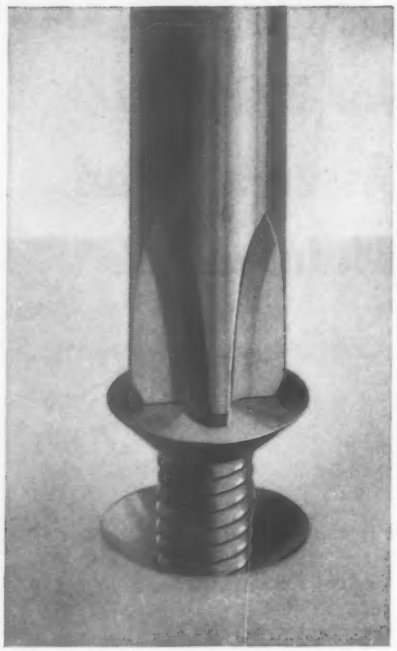
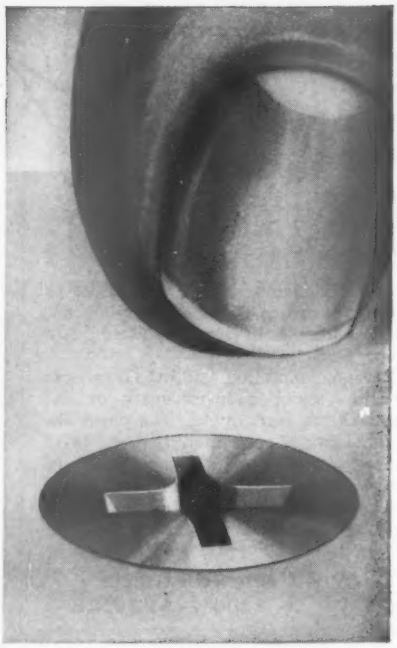
Screw mates with driver



Goes in at top speed



Can't slip to mar surface

PHILLIPS SCREWS...the fastener with a plus!

Continuing Product Improvement (A few of many recent design changes in the Phillips screw)

- Change to 2° wing to provide more effective driving, better driving fit.
- Fillet added at upper edge of recess to permit easier driver entry and freedom from burring during driving.
- Substitution of a #2 (larger) recess for #1 on size 6 Phillips truss heads for better driveability and longer tool life.
- Slight increase in depth of Phillips recess on 100° alloy aircraft parts for better driveability without loss in head strength.

Phillips cross-recessed-head design helps you speed production, reduce costs...here's how:

Compare Phillips Cross-Recessed-Head Screws with other types of fasteners on production speed, alone!

With Phillips screws, the cross-recess mates with the driver. There's no danger of driver slippage, no slow-down in production. On the contrary, Phillips screws are ideal for use with power drivers in automatic assembly operations. Matched mating of bit and recess permits speedy assembly in awkward positions by a single operator. This perfect alignment assures straight and true driving, reduces effort required, cuts worker fatigue and increases efficiency.

But increased production speed at reduced cost is just one of the big reasons behind the continued growth and national acceptance of Phillips screws today. Greater holding power and improved appearance are other important factors that have led to this widespread adoption of the Phillips recess by so many leading users in practically every type of assembled product.

What's more, Phillips Cross-Recessed-Head Screws are constantly improved for more efficient driving and better quality in your finished product. (See box copy.) The Phillips recess is made in every type of head configuration to a universal standard by most leading fastener producers. On your fastening jobs, specify these high quality Phillips Screws. 9-1

SCREW RESEARCH ASSOCIATION

(Licensed Manufacturers of Phillips Screws and Drivers)

PHILLIPS CROSS-RECESSED-HEAD SCREWS . . . THE FASTENER WITH A PLUS

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assembly and fastener engineering

NOVEMBER, 1959

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What subjects would you like to see published in future issues?_____

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assembly and fastener engineering

NOVEMBER, 1959

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ADVERTISEMENTS

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What article in this issue interested you most?_____

What subjects would you like to see published in future issues?_____

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USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite this page.

SET SCREW CHART

Over 1001 applications for self-locking set screws are noted on an 11" x 16½" chart suitable for filing or posting. Nine types of set screws are specified by materials, drives, points, hole size and special requirements. Details are given on a hopper feed system. Set Screw & Mfg. Co., Bartlett, Ill.

Use postpaid card. Circle No. 50

NON-SLIP SPRING WASHER

Sawtooth Belleville washers provide non-slip, anti-vibration action in both spring and dynamic loads. Technical Bulletin ST-1 illustrates their action with drawings and text and specifies the washer by screw size. George K. Garrett Co., Inc., Torresdale Ave. at Tolbut St., Philadelphia 36, Pa.

Use postpaid card. Circle No. 51

AIR NUTRUNNER

The 804 Impactool delivers 1200 impacts per minute and is said to have 40% more nut-running power and 100% faster rundown than its predecessor. Other details on the pneumatic portable power tool are presented in a two-page Form 5244. Ingersoll-Rand, 11 Broadway, New York 4, N.Y.

Use postpaid card. Circle No. 52

NYLON SCREWS, NUTS

Molded nylon screws and nuts are designed for electrical installations where high dielectric strength and corrosion resistance are important. Four-page Form 5050 charts mechanical and thermal properties and gives specification on the fastener line. Weckesser Co., 5701 Northwest Hwy., Chicago 30, Ill.

Use postpaid card. Circle No. 53

PREPACKAGED FASTENERS

Manufacturers whose products must be installed or assembled by the consumer will be interested in a new brochure. The advantages in using prepackaged fasteners are outlined. Different packing materials, types of packages and list of sample users are given. Delta American Screw & Mfg. Co., 1523 E. 42th St., Cleveland 3, Ohio.

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FLUSH LATCHES

Precision mechanical devices—including latches, hinges, fittings, cable terminals—is the theme of two four-page folders. Drawings of typical flush latches, applications and features are presented. Custom engineering facilities are shown in photos and text. Hartwell, 9035 Venice Blvd., Los Angeles 34, California.

Use postpaid card. Circle No. 55

MINIATURE SCREWS

Four-page catalog "Precision Miniature Screws" describes an inventory of 25 million machine screws in all head styles and metals. They include even sizes 0-80, 1-72, 1-64, 00-90 and 00-96. Lengths range from 1/16" to 1½". Hardware Specialty Co., Inc., 479 Washington St., New York 13, N.Y.

Use postpaid card. Circle No. 56

SPECIFYING ADHESIVES

Highlight of an eight-page brochure is a chart which classifies 31 adhesives, coatings and sealants by uses, characteristics, color, base, solvent, viscosity, approx. solids, weight and application. Angier Adhesives, 120 Potter St., Cambridge 42, Mass.

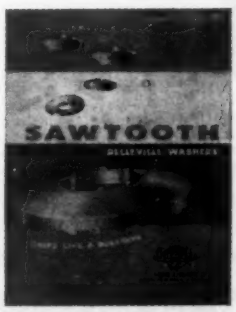
Use postpaid card. Circle No. 57

MAGNETIC PLUGS

Pipe plugs which incorporate a permanent magnet to pick up and hold undesirable ferrous particles and chips in circulating oil systems are introduced in 22-page Catalog MPC-57. How and where to use the plugs, thread and head sizes available, typical applications and a sample list of users is infor-

(See 52)

(See 50)



(See 51)

mation provided. Lisle Corp., Clarinda, Iowa.

Use postpaid card. Circle No. 58

RETAINING RINGS

An engineering manual is said to cover 80% of known retaining ring applications. The 40-page booklet specifies Spirolox and Circolox rings, with information on materials and finishes, design factors, charts and typical layouts. Ramsey Corp., 3693 Forest Park Blvd., St. Louis 8, Mo.

Use postpaid card. Circle No. 59

ASSEMBLY MACHINES

Twenty-two custom engineered assembly machines are illustrated and described in Series 5 bulletin. The nomenclature of a dial unit featuring a universal motion cage is specified. American Special Machine Co., 1401 Webster Ave., Chicago 14, Ill.

Use postpaid card. Circle No. 60

CORROSION RESISTANCE

Corrosion resistant fastenings are net priced in an 88-page catalog. Bolts, nuts, screws, washers and rivets in eight metals are specified and priced in easy-to-locate format. H. M. Harper Co., 8200 Lehigh Ave., Morton Grove, Illinois.

Use postpaid card. Circle No. 61

WELDING CASE HISTORIES

"Resistance Welding At Work", Vol. 5, No. 5 tells of cost savings in seven commercial and aviation applications where resistance welding was applied. The 16-page bulletin is illustrated. Sciaky Bros., Inc., Dept. L-26, 4915 W. 67th St., Chicago, Ill.

Use postpaid card. Circle No. 62

EPOXY ADHESIVE

A technical data sheet briefs the user on Bondmaster M648T epoxy adhesive for bonding all metals and other rigid materials. Surface preparation, preparation of adhesive, application are treated. Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N.J.

Use postpaid card. Circle No. 63

PLIERS

Pliers and wrenches for the electrical and electronics industries are the topic of 26-page Catalog 101A. Each of 62 models is pictured and specified. Mathias Klein & Sons, 7200 McCormick Rd., Chicago 45, Illinois.

Use postpaid card. Circle No. 64

SEALING RIVETS

How closed-end Pop rivets seal as they set is shown in sequence drawings. A two-page flyer lists shear and tensile strengths by rivet diameter and gives complete specifications by sizes. Hand and power tooling is available. Pop Rivet Div., United Shoe Machinery Corp., Shelton, Conn.

Use postpaid card. Circle No. 72

DRILLING, TAPPING PARTS

Features of the Model 409 Beco drill and tapper are discussed in a four-page brochure. The machine locates and holds rivets or other shouldered parts for axial drilling or tapping to very thin walls. Production rates for aluminum, brass and steel are listed. Batchelder Engineering Co., Springfield, Vermont.

Use postpaid card. Circle No. 65

FASTENER HANDBOOK

General reference data on purchasing fasteners is combined with prices and specs for a complete line of stainless steel and nylon parts. The 172-page catalog is up-to-date. Anti-Corrosive Metal Products Co., Inc., Box 1894, Albany 1, N.Y.

Use postpaid card. Circle No. 66

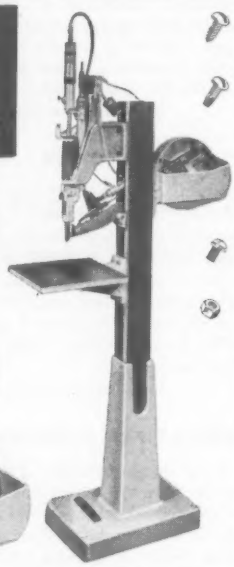
SCREW-LOCK INSERTS

How a wire thread insert locks the screw as it protects the tapped hole is shown in eight-page Bulletin 738B. Design benefits, production data, military design data are presented in charts and text. Heli-Coil Corp., Danbury, Conn.

Use postpaid card. Circle No. 67

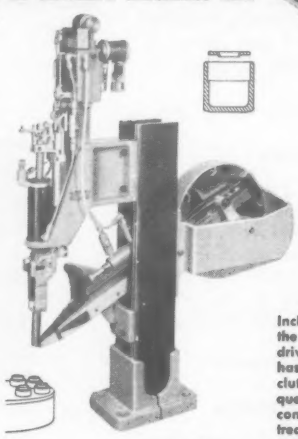
DIXON AUTOMATIC ASSEMBLY EQUIPMENT

For fast, accurate assembly of small parts, DIXON has developed two types of equipment: *Auto-Positioners* for automatic assembly work and *Auto-Torque Drivers* for automatic placing and the driving of screws and nuts. Many combinations of standard machines and components are available.



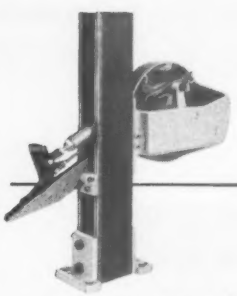
AUTO-POSITIONER

This small-parts assembly machine is available as a completely automatic station (at right) for use at a dial or straight transfer table, or it can be furnished as a self-contained machine with work table and foot treadle to initiate the cycle. Has positive-acting piece-parts feeder and sensing mechanism to stop the machine if part is missing or improperly placed. Easy to install and tool.



AUTO-TORQUE DRIVER

Including all major features of the DIXON Auto-Positioner, this driver for screws and nuts also has a compact air motor and a clutch that provides precise torque control. Furnished as a self-contained machine with foot-treadle control (above) or as an automatic station for use at dial or straight transfer table.



PIECE-PARTS FEEDER

Operated by an air cylinder which actuates the feeder drum and shuttle-type escapement, this feeder delivers parts to assembly machines or other equipment. The straight track and positive-acting escapement permit low-angle mounting and provide efficient parts control.

PARTS ESCAPEMENT

Releases parts singly or in multiples. Simple, efficient, operates at speeds up to 200 per minute. Models for air, solenoid or mechanical operation.

INTERMITTENT DRIVE

A compact clutch-brake unit, designed for accurate start-stop cycling of indexing mechanisms for assembly or other work. Wide range of speeds and torques.

Descriptive Bulletins will be sent on request.

DIXON **DIXON AUTOMATIC TOOL, INC.**

2309-23rd Avenue • Rockford, Illinois

EQUIPMENT FOR AUTOMATIC PARTS HANDLING AND ASSEMBLY

Use postpaid card. Circle No. 253

LOCKBOLT FASTENING TOOLS

Form 8-475 illustrates new pneumatic-hydraulic tools designed for installing lockbolts and blind rivets. Operating characteristics, performance curves and outline dimensional drawings are included on both units. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.

Use postpaid card. Circle No. 66

CONVEYORS

Gravity and power conveyors in actual assembly line installations are pictured throughout 16-page Bulletin 69. Details on each application, including those in the aircraft, electrical and appliance industries, are provided through captions and text. Standard Conveyor Co., 315 N.W. 2nd St., North St. Paul 9, Minn.

Use postpaid card. Circle No. 69

SOCKET SCREW STANDARD

Specification and application data for a new socket screw standard—the large-diameter-head Unbrako socket head cap screw—is provided in a four-page technical bulletin. A helpful tabulation of seating torques provides recommended tightening values size-by-size. An indication of relative load-carrying ability of the new series is given in a bar chart. Standard Pressed Steel Co., Box 1121, Jenkintown, Pa.

Use postpaid card. Circle No. 70

FREE-RUNNING LOCKNUT

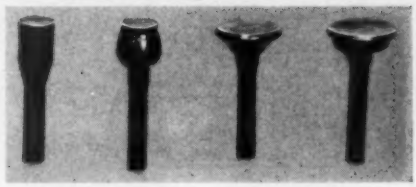
A free running, self-energizing, reusable locknut is presented in a four-page brochure organized for quick reading. Recommended for protecting bolts, studs and axle shafts, the fastener's action is pictured and standard specs listed. Klincher Locknut Corp., 2153 Hillside Ave., Indianapolis, Ind.

Use postpaid card. Circle No. 71

SCREW MACHINE DIRECTORY

The 1959-60 Buying Directory will assist buyers in locating sources of supply for screw machine product requirements. The 80-page directory lists location and facilities of 270 companies in 25 states. Free when requested on company letterhead. National Screw Machine Products Assoc., NSMPA Bldg., 2860 E. 130th St., Cleveland 20, Ohio.

COLD FORMING DIFFICULT PARTS . . .



WITH THE

BOLTMASTER

Hexagon Socket Screws, Shafts with Geared Shoulders, Hexagon Head Bolts, Shoulder Screws, Engine Valves and bolts having 5 different diameters are normal applications for these German built cold forming machines.

★ ONE WORK CYCLE—permits completion of very intricate parts

★ PRESSING DIES AT 4 WORK STATIONS—conveniently arranged "get-atable" position

★ WIRE FEED AT RIGHT ANGLES to the forming slide movement—blanks cut off by main slide eliminating separate cut-off mechanism

★ TRANSFER OF PARTS—by simple transport levers or permanent magnets. Whole mechanism can be swung aside making dies readily accessible

★ POSITIVE EJECTION in punches of 2nd and 3rd station—standard equipment

★ 4 MODELS—capacities ⅜", ½", ¾" and 1" bolts

Write or Phone CL 2-7081 for details!

SOLD AND SERVICED IN U.S. AND CANADA BY

The BOLTMASTER Co.

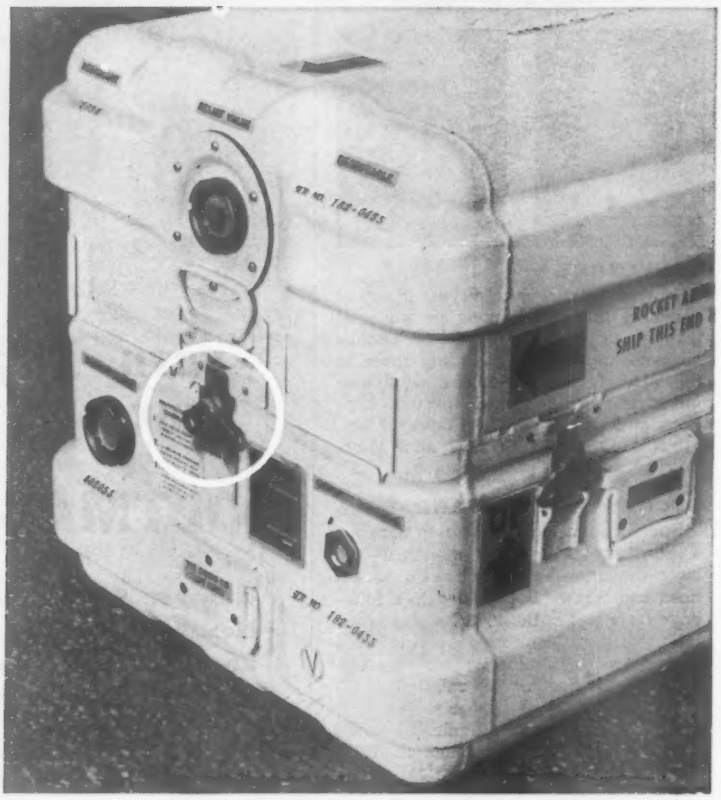
Exclusive importers of German Craftsman Peltzer & Ehlers Machinery—builders of machinery for the Bolt Industry since 1888

5306 West 130th St., Cleveland 30, Ohio

Use postpaid card. Circle No. 254

Falcon missiles travel "first class" in containers secured by LINK-LOCK

Fourteen No. 2 LINK-LOCK fasteners → maintain a pressure-tight seal around cover of Falcon cases.



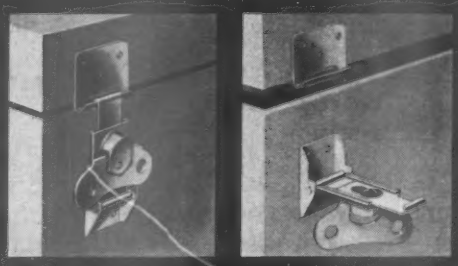
Before they take to the skies, Falcon air-to-air guided missiles are shipped or stored in containers sealed pressure-tight by Simmons LINK-LOCK fasteners.

These precisely engineered fabricated aluminum cases are produced to Hughes Aircraft Company specifications by the following companies: Vendorlator Manufacturing Co., Fresno, California; Allison Steel Manufacturing Co., Phoenix, Arizona; Avco Corporation, Crosley Division, Richmond, Indiana.

Features like these make the LINK-LOCK ideal for use on military cases made to rigid specifications as well as on inexpensive commercial containers:

- Impact and drop resistant.
- Positive-locking without springs.
- High preloading and high load carrying capacity.
- Compact design—lies flat open or secured.
- 3 sizes, for heavy, medium, light duty.
- Flexible engagement latch design... can be varied to suit different applications.

Write for Catalog #1257. Contains complete details of LINK-LOCK and other Simmons Fasteners with unlimited money-saving applications. Samples and engineering service available on request.



Half-turn applies high closing pressure, counter-turn disengages for opening. LINK-LOCK lies flat open or closed.

SIMMONS

FASTENER CORPORATION

North Broadway, Albany 1, New York

QUICK-LOCK • SPRING-LOCK • ROTO-LOCK • LINK-LOCK
DUAL-LOCK • HINGE-LOCK

See our 8-page catalog in Sweet's Product Design File

Use postpaid card. Circle No. 232

INDUSTRY MAKES NEWS

ENGINEERING GROUPS BUILD HEADQUARTERS

Construction is under way on a $12 million United Engineering Center to house the headquarters of 18 U.S. engineering societies with a combined membership of over 300,000. The 18-story structure will occupy the block between 47th and 48th Streets on United Nations Plaza in New York City.

The slim tower of glass, metal and limestone rising from a broad two-story base is expected to be completed in mid-1961. Financed by gifts from industry, individuals and the contemplated sale of the Engineering Societies Building, the structure will have 263,000 sq. ft. of floor space.

Past and future generations of engineers are represented by Herbert Hoover and Rensselaer Polytechnic freshman Jerry Fujimoto, who broke ground for the new United Engineering Center in New York City. At right is Andrew Fletcher, president of United Engineering Trustees.

The societies—including the American Welding Research Council—are responsible for a large part of the nation's technical publications, industrial standards and engineering conferences.

SATELLITE 'BEEP' OPENS ASSEMBLY PLANT

With a signal from the U.S. Paddle-Wheel satellite orbiting 23,000 miles from earth, Lear, Inc., dedicated its new instrument manufacturing and assembly plant in Grand Rapids, Mich. recently.

A crowd of 4000 saw Deputy Defense Secretary, Thomas S. Gates, press a button that called in the magnified beeps translated electronically so that they were both audible and visible, which dropped the curtain on a plaque which read: "This plant is dedicated to progress in air and space science, in technology and human security."

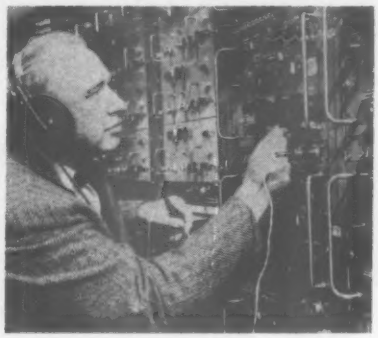
Lloyd H. Manamon, engineer in charge of the Astro-Observation Station at Ft. Monmouth, N.J., chose the Paddle-Wheel because of the intensity of its signal and its position to coincide with the

continued

WHAT FASTENS HYDRAULIC TURBINES? The answer is found in this partially completed group of turbine coupling nuts and bolts at Allis-Chalmers York (Pa.) Works for use in the fabrication of seven 140,000-hp, 92-ft. head turbines for the Chelan County Public Utility District's Rocky Reach Hydroelectric Project at Wenatchee, Wash. A total of 476 precision fitted, forged steel nuts and bolts in 4¾" and 6¼" diameters will be used, 18 at each runner flange, 32 at the intermediate shaft end, and 18 at the generator shaft connection.

dedicatory hour time schedule in Grand Rapids. It was transmitted over communication lines from the U.S. Army Signal and Research Development Laboratory.

Prior to the dramatic moment, a formal program included talks on the future of space exploration by Roy W. Johnson, director of the Advanced Projects Research Agency of the Defense Department, and William P. Lear, Sr., chairman of the board of Lear, Inc.



Engineer L. H. Manamon tunes his receiving equipment to pick up a satellite signal at the Astro-Observation Center at Ft. Monmouth, N.J.

The 172,800 sq. ft. facility doubles the capacity of Lear's Instrument Division. It cost $2 million to build and is equipped with 3 million in facilities. The plant is located on a 48-acre site and employs 2200 in the making of components and systems for aircraft and missiles.

Information on the unique assembly facilities and operations at Lear can be found in this issue's "Industry at Work" department.

WASSCO PUBLISHES SOLDERING NEWSLETTER

Issue No. 1 of the "Resistance Soldering News Letter" has been published by the Wassco Electric Product Corp. and copies are available from the former Joliet, Ill. firm now located at 2032 2nd Ave. So., St. Petersburg 12, Fla.

SCIAKY RESEARCHES LEAK-TIGHT WELDS

Development work for the chemical warfare laboratories on how to produce a leak-tight welded joint in thin steel walled containers for toxic agents was the subject of a talk by M. J. Welther, of Sciaky Brothers Incorporated, and S. M. Robelotto, North American Aviation, at the annual fall meeting of the American Welding Society in Detroit.

Ring projection welding, consisting basically of a slightly raised ring of metal which melts when a current of electricity is applied, was used. This ring of metal forms a continuous weld and a leak-proof joint. Specimens were subjected to the most stringent tests. They were dropped upon a steel plate from a height of 12 feet; tested for leaks and then tested with a ram.

CAMBRIDGE THERMIONIC EXPANDS PLANT

Cambridge Thermionic Corp., Cambridge, Mass., announces a plant expansion program which will provide a total of 30% additional floor space. Frank Lyman, Jr., president, stated that the new construction will house a screw machine department, new products development laboratory, and environmental test facilities. Construction is scheduled to be completed this fall.

HERRICK DIRECTS SALES AT ETC INC.

Appointment of George L. Herrick to be sales manager of ETC Incorporated has been announced by Edward M. Muldoon, president of the Cleveland, Ohio manufacturer of electric terminals and connectors.

A veteran of many years' experience in sales and customer service in the electrical industry, Herrick will be in charge of a broadened sales effort on behalf of ETC's new line of solderless wiring devices.

SPECIAL RIVETS
like some of the samples shown here . . . or the more commonly used tubular and split rivets . . . they're all alike to the American Rivet Co. And always—our own special brand of quality and service that gets you what you want when you want it.
THE AMERICAN RIVET CO., Inc.
847 N. Kedzie Ave., Chicago 51, Ill.
Write for price list. For specials, send specifications for prices.
AMERICAN RIVETS
BUY AMERICAN Tubular and Split RIVETS

Use postpaid card. Circle No. 256

Stop slow, bumbling driving methods

GO MAGNETIC WITH Magna-tip®

SCREW DRIVING ACCESSORIES

You can speed assembly operations and stop inefficient fumbling with Magna (Permanently Magnetic) bit holders, finders and sockets. Fit all power screwdrivers to hold screws, bolts or nuts firmly for one-hand driving. Hundreds of plants are now using them profitably. Ask your power screwdriver salesman for details.

WRITE for manual on the complete line of Magna-tip bit holders, finders, sockets and hand screwdrivers. Dept. 95G4, Magna Driver Corp., 779 Washington St., Buffalo 3, N. Y.

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SATELLITE PRODUCTION building has been recently activated at the Lockheed Missiles and Space Division's sprawling 645-acre Sunnyvale site as the Division's headquarters for the Discoverer, Midas, and Samos satellite programs. The $8 million, 346,000 square foot building houses all of the engineering groups working on development and production of the three satellite projects.

THOR'S GOETZ TRANSFERRED TO CALIF.

Elmer J. Goetz has been appointed office manager of Thor Power Tool Company's Los Angeles customer sales and service branch. Goetz succeeds William Titus, who will become Thor industrial salesman in the San Diego area. For the last seven years, Goetz has been supervisor of the customer service department at Thor's Aurora (Ill.) works.

NEW PLANT FOR ILL. TOOL DIVISIONS

Pascol and Calinoy, two West Coast divisions of Illinois Tool Works, Chicago, are sharing the occupancy of a new plant in Hawthorne, Calif. Pascol was formerly in El Segundo and Calinoy in another area in Hawthorne.

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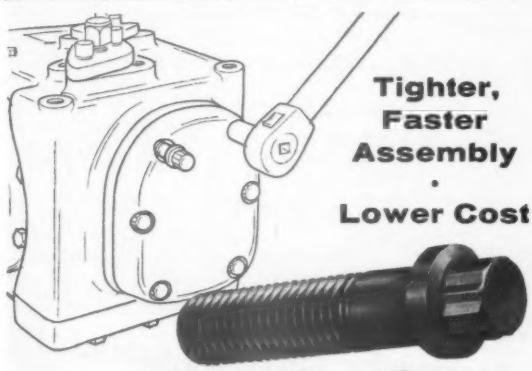


Tighter, Faster Assembly • Lower Cost

with

countr-bor®

Screws

Tighter wrenching. No special tools needed. Fits flush in standard counterbored holes. Improves product appearance.

Save up to 20% on the screws alone and get greater holding strength.

Send for literature and samples of the sizes you wish to try.

FERRY CAP & Set Screw Company

2195 Scranton Road • Cleveland 13, Ohio

Use postpaid card. Circle No. 258

hard steel stud saved

by cold heading

The tough alloy-steel (4615 or 8615) used for this stud created a production problem. Machining would waste a lot of metal. Even cold heading seemed wrong, because of the hardness and poor flow characteristics of the metal.

But Progressive did it. We cold headed it—and produced naturally stronger studs. We used bar stock of nearly half the diameter needed to machine it, and got over 2½ times as many studs from the same amount of metal.

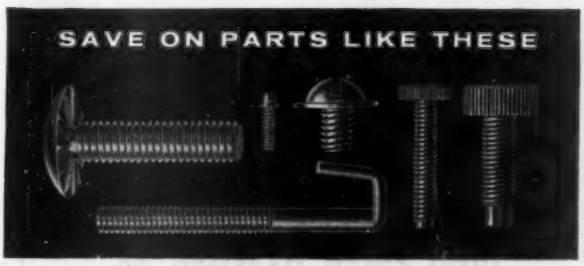
You can make similar savings. Write for more case histories in our *"Bank Book of Savings in Cold Heading."*

MACHINE SCREWS AND NUTS, SEMS FASTENERS, SLOTTED TAPPING SCREWS AND PHILLIPS HEAD SCREWS

THE TORRINGTON COMPANY

Progressive Manufacturing Division

40 Norwood Street • Torrington, Connecticut



AMONG OPERATIONS PERFORMED BY PROGRESSIVE are heading and extruding simultaneously; flattening; piercing; drilling; bending; pointing; fluted or diamond knurling; trimming; turning tenons, shoulders or recesses; struck or sawed slotting; notching.

Use postpaid card. Circle No. 259

N. Heath McDowell, formerly general manager of Pascol, will direct both divisions, which will share manufacturing facilities and engineering personnel to some extent. Herbert O. Hansen will continue as Calinoy division sales manager.

BOEING TESTS IBM FACT-GATHERING SYSTEM

An electronic fact-gathering system to give plant managers closer control over factory operations was successfully field-tested recently at the Wichita plant of the Boeing Airplane Co. on B-52 production lines.

Data is instantaneously summarized in card form by the reproducing punch of the output station.

The IBM 357 Data Collection System provides a network of reporting stations on the assembly line through which workers feed information on work-in-progress to a manufacturing control center.

The hardware of the new IBM system consists of:

1. reporting or input stations, devices similar in size and appearance to a wall-mounted time clock, which read and flash data to a central point from "man" and "job" cards fed into them by production workers. A small keyboard can be affixed to input stations, into which employees can enter variable information.

2. a control unit, which acts much the same as an automatic telephone switchboard to sequence data transmissions as they are initiated from the various input stations.

3. the central or output station, which reproduces in a data processing room the punched card information fed into the system by workers at input stations as far as one cable mile away. Up to 20 input stations can be wired through a single control unit into a single output unit, depending on the volume of the data transmitted. Plants can install as many of these building-block networks as required.

4. an optional automatic clock which can insert time into punched card reports.

Systems analyst (right) shows assistant foreman at McDonnell Aircraft how IBM input station operates. Pre-punched card travelling with a part is inserted into the reader, while variable information is transmitted by means of the keyboard.

TOWNSEND EXPANDS AIRCRAFT SERVICES

Townsend Company's Cherry Rivet division has expanded its services to the aircraft industry with the appointment of John B. Borah to the technical sales department. Borah will be headquartered in Columbus, Ohio. He was formerly associated with Waldorf Instruments, the Aviation division of Weatherhead Co. and General Controls Co.

HIGH SPEED equipment for better production, lower cost

RIVETING HAMMERS

Available in 10 sizes. Handle full range of work up to 2" diameter solid rivets. Quick to set up or change tools. Available in bench and pedestal models. Backed by finest, most complete tooling service in the industry.

NOISELESS RIVET SPINNERS

Motor-driven, noiseless, rugged. Spindle travel adjustable. Fast cycle. Produces absolutely uniform assemblies. Model E (capacity 1/8") and Model G (capacity 5/16") available in both bench and pedestal models, foot or AIR operated.

ELECTRIC SOLENOID PUNCH

Stakes, rivets, marks, cuts off, bends, crimps, etc. with positive alignment. 4½" maximum vertical opening (2¾" minimum for tools and work). 1¾" spindle travel, adjustable downward. Fast cycle. 3500-lb. impact. Single or dual, hand or foot control.

AUTOMATIC STAKING MACHINES

Pressure pad built into spindle firmly secures work before blow. Allows for variation in thickness. Delivers uniform blow every time. Quick, easy adjustment, wide power range. 4 sizes—bench and pedestal models, foot and air operated.

We manufacture the most COMPLETE LINE of assembly machinery on the market today, so generally can recommend the CORRECT TYPE MACHINE for any assembly application.

FREE Assembly Engineering Service

Just send samples or blueprints of parts to be assembled. We'll recommend the right tools, procedure and equipment to use . . . without cost or obligation.

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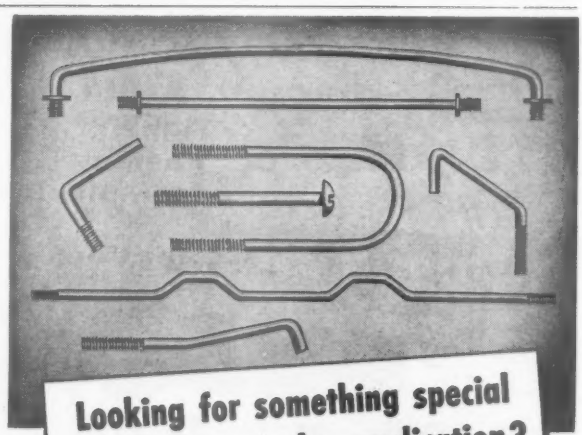

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STEEL FIRMS PROBE LABRADOR ORE SITE

Five United States and Canadian mining and steel companies are investigating the development of a body of iron ore in the Wabush Lake area of Labrador. Inland Steel Co., Chicago, has just become a 10% owner of the Wabush Iron Co., Ltd., which includes The Youngstown Sheet and Tube Co., The Steel Co. of Canada, Ltd., Interlake Iron Corp. and Pickands Mather & Co.

Potential of the ore body is estimated at 1 billion tons of low grade ore which will be concentrated to a material of high iron content. A pilot plant will begin shipment in 1960 for large-scale tests in steel plants. Shipments will start by 1965 at an initial annual 4 million ton level, eventually to reach 10 million.

BUCKEYE REALIGNS DAYTON AREA SALES

Reorganization of the Dayton, Ohio, sales area has now been completed by Buckeye Tools Corp., Dayton. This area takes in most of eastern and west central Indiana, three northern Kentucky counties near Covington, and western Ohio.

LYTLE

Mason H. Lytle is now area sales manager, assisted by Lindsey Bell. Two new manufacturers representatives are L. B. Vinson, Lima, and Bob Standiford, Indianapolis. H. H. Harris recently left Indianapolis to become the firm's automotive specialist in Detroit.

BLACK & DECKER NAMES CINCINNATI MGR.

Jay T. Redmon has been appointed Cincinnati district manager of The Black & Decker Mfg. Company's Industrial-Automotive Sales Division.

Redmon succeeds Ernest E. Randle, recently appointed sales manager of the Canadian subsidiary, Black & Decker

continued

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☐ Simplify assembly
☐ Improve appearance with

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Cap Nuts
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Thumb & Wing Screws
MOLDED NYLON
Screws
Hex Nuts
Washers
Screw Insulators

CAP NUTS

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OPEN END
HIGH TYPE
WASHER BASE

Distinctive, accurately dimensioned, smoothly finished, completely free of tool marks and cut-off-burrs.

¼" to 15/16" hex
No. 4-36 to 7/16"-20 threads.

- High in quality
- Uniformly accurate
- Low in cost
- Wide range of stock styles, types, sizes and threads

Produced in one high speed automatic operation, GRC's exclusive methods assure uniformity, smooth, rustproof and corrosion resistant surfaces and the lowest possible cost. New kinds of fasteners never before available . . . modifications in stock fasteners for specialized use . . . infinite variety in styles, types and sizes, have been made possible by GRC's special automatic die casting and molding machines.

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MULTIPLE OPERATIONS

All operations performed simultaneously

Feed once for all operations

Mill shank end square (Corrects angular cut-off; makes length exact; provides superior, even crimping all around)

Tap drill

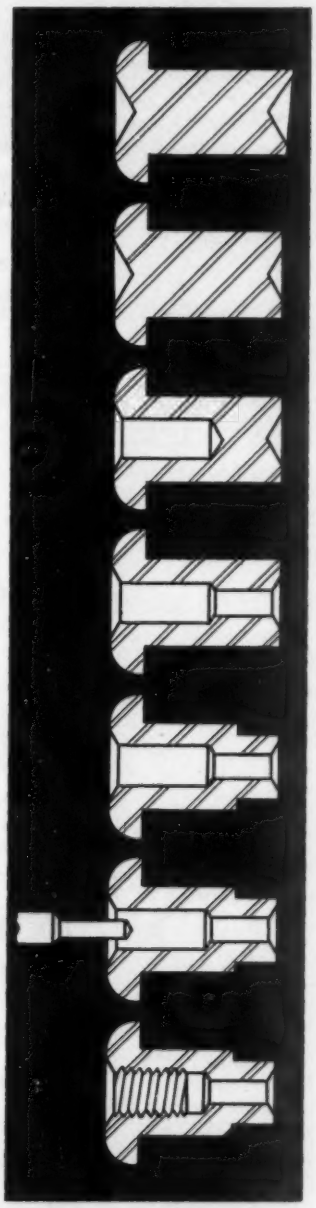
Drill thru from shank end (Faster than with long stroke required by drilling from head end)

Hollow mill, concentric with hole & body (Smooth finish; no burrs; simple, inexpensive tooling)

Probe, to be sure both holes are drilled before tapping

Tap

50 to 120 pieces completed per minute, depending on size and material



BECO Multi-Spindle Machines

means fastest production and least labor cost

BATCHELDER ENGINEERING CO.
Springfield, Vermont

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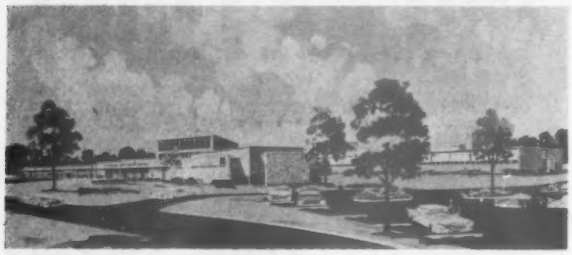
Mfg. Co., Ltd., of Brockville, Ontario. Redmon started with the company in 1939 as a repairman in one of the nationwide network of Black & Decker service branches and was most recently industrial-automotive manager in Indianapolis.

ASTIN SPEAKS AT L&N PLANT DEDICATION



Automation, which is still in the diaper stage, will reach maturity when machines can talk to machines, according to a top government scientist who said that some fairly simple instruments already at hand are speeding the day when even marketing decisions may be part of an automated production-distribution process.

The scientist, Dr. Allen V. Astin, director of the National Bureau of Standards, spoke at ceremonies dedicating a new $2 million research center of Leeds & Northrup Company in North Wales, Pa., manufacturer of electronic instruments and control apparatus.

Every company, Dr. Astin said, should maintain a scientific staff—even if the staff consists of only one man—because growth depends on keeping up with the swift advances in modern technology.

The development of simple sensing devices, Dr. Astin said, "bring the exciting possibility of the full use of 'feedback' as a practical principle in automatic control. Through these devices," he said, "a physical measurement can be made, analyzed, computed and compared to standards, and then sent to alter or control an operation at another stage in the production process."

GRIES APPOINTS NEW ENGLAND OEM REP.

John V. Muddle Associates of Ashland, Mass. has been appointed exclusive sales representative in New England to handle Gries Reproducer Corp. products and services for the original equipment market.

TOWNSEND SEPARATES WESTERN FACILITIES

New West Coast manufacturing facilities have been established by the Cherry Rivet Division, Townsend Company, Santa Ana, Calif.

Separation of commercial and aircraft fastener activities was accomplished by moving the entire Commercial Products Dept. to 805 South McClay St., also in Santa Ana. P. W. Stewart, formerly mechanical superintendent of the Cherry Rivet Div., has been named superintendent of the Commercial Products Department.

EKLUND NAMED KAYLOCK AD MANAGER

Robert D. Eklund, former copy chief of Geyer Advertising Co., Dayton, Ohio, has been named advertising manager of the Kaylock division of Kaynar Mfg. Co., Inc.

Before joining Geyer, Eklund was a copywriter for the MacDonald-Cook Company, South Bend, Ind., TV-radio director for Olian and Bronner, Inc., Chicago, and writer for the American Broadcasting Company.

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— Up to 6"
SPRING-NUTS
Preassembled Nut & Spring Lock Washer
FINISHED NUTS
Heavy • Regular Jam
VOLUME-CONTROL & SWITCH MOUNTING NUTS
Single & Double Chamfer
STOP-NUTS WITH FIBER INSERT
WING NUTS
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Standard & Small Pattern — Single & Double Chamfer
CAP NUTS
STOP-NUTS
Standard & Reversible One-Piece — Re-usable
Available in Stainless Steel, Silicon Bronze, Brass, Aluminum and Steel
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Unique, positive lock and seal action — when nut is tightened, "cold-flow" action of plastic washer results in perfectly tight seal.

No loss of holding power — you can use rugged Dubo Lockwashers time and again.

Impossible to fit wrongly — fit perfectly every time because they are symmetrical with no threaded parts.

PLUS . . . excellent electrical properties . . . exceptional wear resistance . . . good shock absorption . . . resist corrosion, chemicals . . . non-flammable . . . high flexural strength.

Especially useful for electrical insulation, or for control of electrolytic corrosion between dissimilar metals.

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BOOTS PROMOTES FERGUSON ON WEST COAST

John W. Ferguson has been promoted to general manager of the Boots Aircraft Nut west coast offices in Pasadena, Calif., announced Jay Boots, president. Ferguson has had a background of 20 years in aircraft manufacturing, engineering and sales. Since 1952 he has been the west coast representative for Boots.

RESISTANCE WELDER ORDERS INCREASE

Resistance Welding business for the first seven months of 1959 is 40% ahead of orders for the same period last year, according to statistics compiled by the Resistance Welder Manufacturers Association. New orders during August amounted to more than $2-¼ million, which represents an increase of 17% over July.

Shipments have also continued to rise, with August figures showing a 29% increase over the preceding month. For the seven-month period, 1959 shipments are 22% in excess of 1958.

Members reported backlogs of nearly $7-¼ million.

ESNA ACQUIRES CALIFORNIA BOLT MAKER

Elastic Stop Nut Corporation of America has entered into an agreement to exchange 8000 shares of ESNA common stock for all of the issued and outstanding shares of Aircraft Bolt Corp., El Monte, Calif., W. F. McGuinness, ESNA president, announced.

McGuinness pointed out that this acquisition is related to his company's announcement in October 1958 of the ESNA-Thred process, a method of producing bolts with high fatigue life. Aircraft Bolt Corporation's facilities will be expanded. Walter Kusterer, vice-president and general manager of

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GRIP-NUT family of GRIPCO FASTENERS

All types and sizes of Gripco fasteners listed in catalogue are available for immediate delivery.

Qualified fastener engineers are available for consultation on all your assembly problems.

Other Gripco Products:

- BRASS GRIPCO OR CENTERLOCK NUTS.
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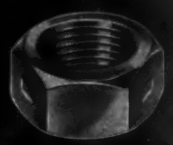
GRIPCO LOCK NUT
One piece all metal.



GRIPCO CENTERLOCK NUT
Locking feature in the center for fast feeding. Can be applied from either end.

GRIPCO CLINCH NUT
With or without Gripco Lock. For application to metal too thin to thread or for inaccessible assemblies. Hex collar prevents turning when torqueing bolt.

GRIPCO PILOT-PROJECTION WELD NUT
With or without Gripco Lock. Centering collar positions nut and protects threads from weld spatter.

GRIPCO COUNTERSUNK WELD NUT
With or without Gripco Lock. Countersink protects threads from weld spatter.

The Nation's Oldest Manufacturer of Lock Nuts

Send for samples and NEW CATALOG today

GRIP-NUT COMPANY

113 MAPLE AVE. ★ SOUTH WHITLEY, INDIANA

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ABC and Danford J. Dodds, chief metallurgist will continue in their present capacities.

MIDLAND AIRCRAFT EXPANDS TO WICHITA

Midland Aircraft Division of Midland Screw Corp., announced the opening of a warehouse in Wichita, Kansas, managed by the Zites Aviation Sales Corp.

HARPER APPOINTS NEW YORK MANAGER

George Fischle has been appointed district manager for the H. M. Harper Co., Morton Grove, Ill., in the New York City and Upper New Jersey area. His office is the eastern warehouse located at Mamaroneck, N.Y.

Fischle's background includes several years as assistant sales manager of a large nut and bolt manufacturer.

REICHHOLD TO PRODUCE MOLDING MATERIAL

Reichhold Chemicals, Inc., White Plains, N.Y., will soon build its first plant for the production of phenolic molding compounds, used in the manufacture of electrical and automotive components and parts. It will be located in the East.

Robert A. Schmittberger has been named to head the newly-formed Phenolic Molding department and will be assisted by RCI engineers and those of the recently-acquired Varcum Chemical Corp. and its Canadian subsidiary. Schmittberger is a 1950 graduate of Columbia University with a B.S. in Chemical Engineering.

MIDLAND-ROSS MAKES PERSONNEL CHANGES

Midland-Ross Corp., Owosso (Mich.) Div., has announced two personnel appointments. Richard Fritz, former midwest regional manager, will be sales manager, Canada, with headquarters in Toronto. Walter Nichols has been named general service manager. With the firm's engineering department since 1947, Nichols was most recently OEM sales engineer.

FRITZ

NICHOLS

BLACK & DECKER MAKES MIDWEST CHANGES

The Black & Decker Mfg. Co., Towson, Md., has made the following appointments in its Central sales region. M. Scott Rolston is Chicago district manager of the Industrial-Automotive division, moving from Minneapolis. Ralph W. Janelli, Chicago manager of the Hardware division, will add the Minneapolis district to his responsibilities, allowing Paul J. Gagliano to assume the Industrial-Automotive managerial duties in Minneapolis.

BRISTOL ADDS WISCONSIN REPRESENTATIVE

W. C. VanLeuven, sales manager of the Socket Screw Division of The Bristol Company, has announced the appointment of Donald C. Dobson as socket screw products salesman for Milwaukee and the Wisconsin District. Dobson has been with the company for the past four years as its Chicago Warehouse Supervisor. Bristol's Milwaukee office is Room 1327, 735 North Water Street.

look into eyelets your FASTENING to solve PROBLEM

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AUTOMATIC EYELETING MACHINERY

single & multiple settings for product improvement and continuing savings

Manufacturers who introduce precision built Edward Segal eyeleting machines to their fastening jobs find they require less handling and production time over other methods—and the machines are complete with no adaptation necessary. Eyelets usually cost much less, and the fastening looks far better.

Depending upon your operation, these highly reliable machines can be supplied with varying degrees of automation. Feeding is simplified, and because of the Limited Travel Spindle (pat. pend.), even settings as small as .032" I.D. are possible with a minimum of tool breakage.

Let Segal engineers study your fastening problem without obligation. Write for details to section AFE-11

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Manufacturers of eyeleting machinery, special hoppers and feeding devices

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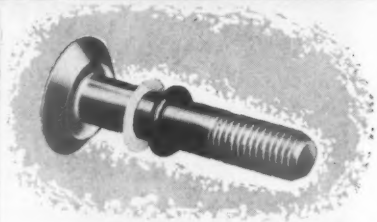
For the ultimate in Sealing . . .
UNISEAL® with TORQ-SET recess



This new combination is an answer to the fastening needs growing out of space age engineering. Positive sealing by the UNISEAL method (which includes MIL SPEC 'O' ring compounds) is combined with the hi-wrenching characteristics of the Torq-Set recess.

This combination is being produced and can be manufactured in a variety of configurations and materials to meet your requirements.

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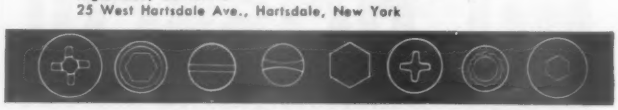

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Small diameter for limited space of aircraft engines and component parts. Positive non-slip adjustment to various lengths of grip. Hand or power. Sizes—Max. cap. ⅝"; and Max. cap. 9/16". Female adapters available.

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Small tool nose diameter for use in close quarters. Permits re-use of studs by gripping thread on nut end of stud—will not mar threads. Made in standard sizes for No. 10 to ⅝" studs

"Bull 'Dog" Stud Driver Designed for Use With Impact Wrenches

Built for rugged use on heavy engines. Equipped with Titan Design, Loose Pressure Plunger. Definitely stands up under vibration encountered when using an impact wrench for motive power.

Titan "Roll Grip" Combination Stud Driver and Puller

Incorporates roll action to grip as little as ⅛ in. of unthreaded body of stud Made in standard sizes from 3/16 to 3 in. inclusive.

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World's Largest Producers Of Stud Drivers And Pullers

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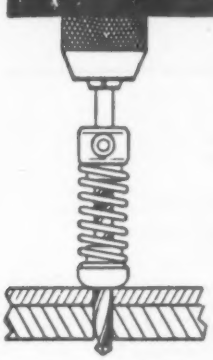
Stop Breaking Drill Bits!

WEDGELOCK DRILL STOP



1. Increases life of drill bits
2. Regulates depth of drill hole
3. Cushions the "breakthrough"
4. Prevents chuck from marring surfaces

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Sheet Metal Clamps
Sets and releases with one hand in one operation. Many styles.

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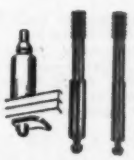
Spring actuated. Powerful. Applied with pneumatic or hand pliers.



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Handles thicknesses up to 2½". Adjustable pressure. Many sizes.

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Fast alignment of rivet and bolt for lighter materials. Applied with pliers.

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ONE LAST WORD

BEWARE OF MANAGERIAL RIGOR MORTIS

Joe Doakes was a fireball. He read and studied everything about his job and the next job above his. Because he coupled his reading with imagination and applied himself, he rose steadily in the world of business. He was honest, industrious, intelligent and creative, so much so that now he is a major executive and qualifies as a Manager. And having arrived, as the saying goes, he's now stopped growing.

To many people who have struggled up the ladder, the position of manager (or similar executive capacity) is the pinnacle of achievement. No further exertion is necessary. All reading and studying stops. Creativity is left to the assistants. Important projects are delegated. Discussions with other Managers on such weighty matters as, "The Effect of Discriminatory Taxation of Migratory Bird Trappers on the Delicate Balance of World Power", occupies his time at the club and at luncheon meetings. This is the right of a Manager (so he thinks), to be so occupied with weighty matters. Foreign competitors may chop his trading area to pieces but this has little effect on him. The next weighty matter to take up at the luncheon meeting will be "Government's Role to Curb Foreign Competition!"

We wish this were all a great silliness, but unfortunately, it's not. Too many capable men stop growing when they attain managerial status. They do not realize that all they have done is reached a plateau, a temporary stopping place. The climb hasn't really begun. Suddenly the manager is not responsible to himself alone, he is responsible to: employees, the success of vital projects, the public, an assorted group of nice people affectionately known as customers, and a breed of submorons dismissed simply as competitors.

The growth of a company is not dependent on helpers and assistants who merely keep things moving, but on the manager in whom is vested the responsibility for growth. The position of Manager is not an end in itself. It is the beginning of increased duty. The need is for more reading, not less; shorter lunch hours, not longer; less activity at the club but more at the office; less reading of reports and more direction. The managerial position carries with it the challenge of maximum creativity.

We live in an age of movement. Nothing is static. Nothing stands still for more than a second. What is new today is old tomorrow. A management consultant told me recently that 90% of the jobs he is called upon to undertake suffer from Managerial Rigor Mortis; managers are resting from the climb. He is blunt in pointing out that if managers had been as active in their executive positions as they were in arriving there, his services would not be needed.

It is not politic to discuss the Managerial Class; still, if it is in order to criticize labor, politicians, foreign competition, crab grass and the Japanese beetle, it is to be hoped that a small naive questioning voice in the wilderness will not be amiss.

Wm. J. Schleicher

Vice President & Editorial Director

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